

3 1761 11764874 1













Digitized by the Internet Archive  
in 2022 with funding from  
University of Toronto

<https://archive.org/details/31761117648741>











CA1 IA 61 - Ø32

Lacking 1974.









Indian and  
Northern Affairs

Affaires indiennes  
et du Nord

# North of 60

## Oil and Gas Activities 1975

IA1  
IA61  
-032







# Oil and Gas Activities 1975

Government  
Publication

**Report on  
the Activities in 1975  
of the Oil and Gas Industry  
in the Yukon Territory  
and Northwest Territories**

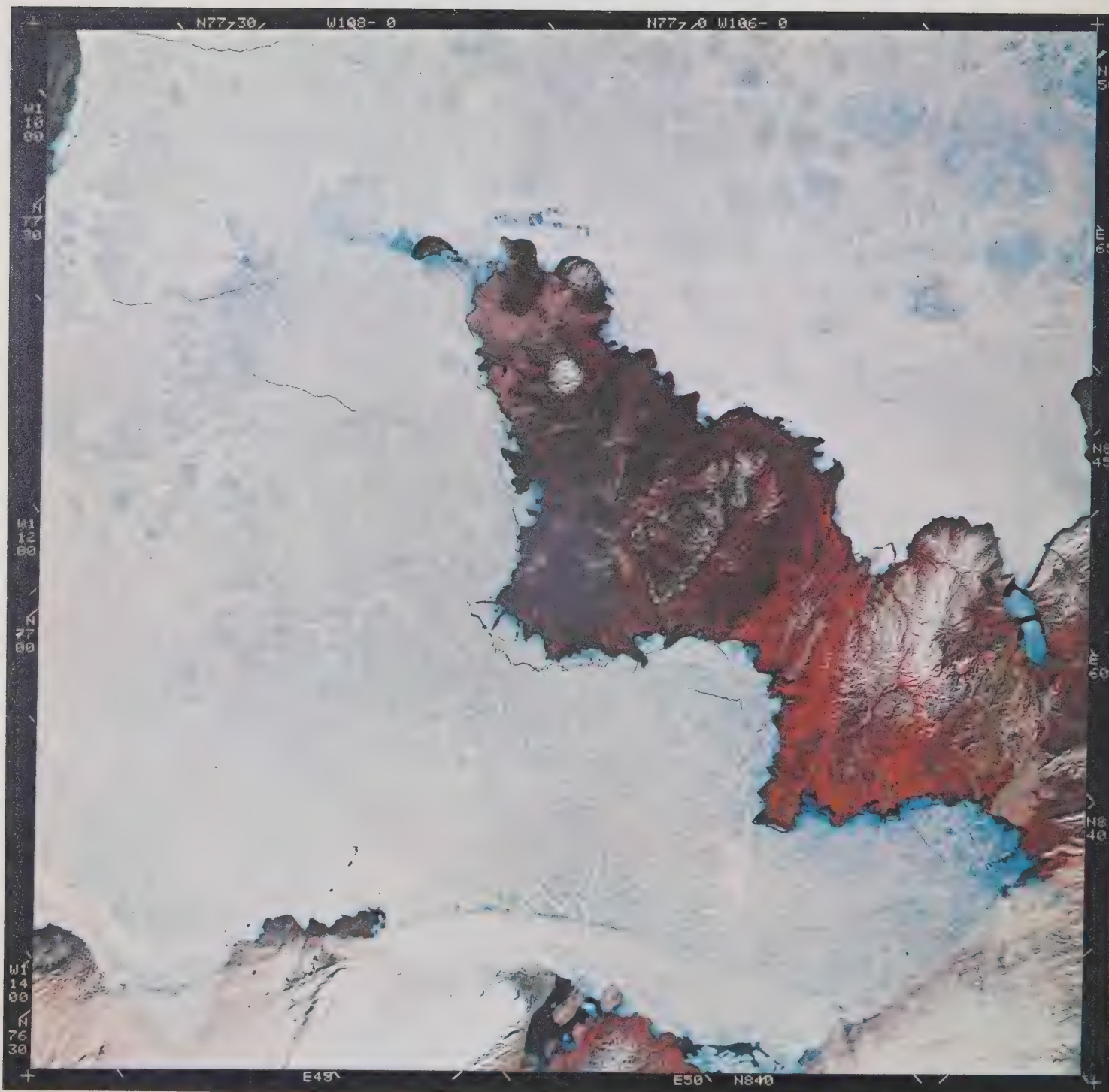
Compiled by  
Oil and Gas Geology and Operations Section  
Oil and Minerals Division  
Northern Natural Resources and Environment Branch

(Edition No. 12)

Published under authority of the  
Hon. Judd Buchanan, PC, MP,  
Minister of Indian and Northern Affairs,  
Ottawa, 1976.  
QS-8112-000-EE-A1

© Minister of Supply and Services Canada 1976  
Catalogue No. R71-6/1975  
ISSN-0317-3291





# Table of Contents

---

5 **Introduction**

---

6 **Summary**

---

- 8 Geological summaries
  - 12 Oil and gas activities
  - 16 Production, Reserves and Refining
  - 18 Land administration
  - 22 Acts and Regulations
  - 28 Revenues
  - 34 Drilling activities
  - 40 Operations
  - 48 Exploration and drilling expenditures
  - 50 Pipelines
  - 54 Participation and research projects
- 

55 **Appendix I**  
Figures 18-21

---

60 **Appendix II**  
Sources for information relative to oil and gas  
activity North of 60

---

70 **Appendix III**  
Directives

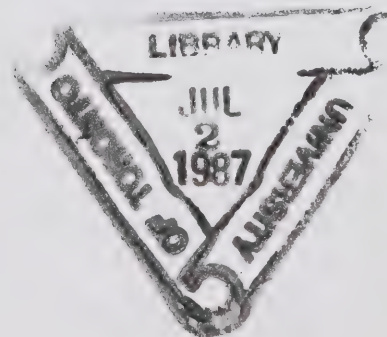
---

72 **Appendix IV**  
Reporting forms

---

74 **Appendix V**  
Selected Geological References

---





# Tables and Illustrations

## Tables

11	Table 1.	Area and volume of sediments
12	Table 2.	Oil and gas discoveries North of 60 to end of 1975
18	Table 3.	Number of issued permits and leases with acreage as of December 31, 1975
29	Table 4.	Gross revenue, oil and gas (calendar year)
30	Table 5.	Gross revenue, oil and gas (fiscal year)
38	Table 6.	Wells abandoned or completed in 1975
41	Table 7.	1973-75 exploration survey statistics

## Illustrations

9	Figure 1.	Geological Provinces (map)
42	Figure 2.	Oil and gas fields and discoveries (map) <i>centre fold</i>
19	Figure 3.	Acreage held under oil and gas permit
20	Figure 4.	Acreage under lease — by year
21	Figure 5.	Oil and gas land acquisitions North of 60 (map)
24	Figure 6.	Permit terms and work requirement zones
25	Figure 7.	Permit terms and deposit requirements — per acre
26	Figure 8.	Additional royalty rates — by areas
27	Figure 9.	Flow diagram of disposal of oil and gas rights
31	Figure 10.	Gross revenue, oil and gas (calendar year)
32	Figure 11.	Gross revenue, oil and gas (fiscal year)
33	Figure 12.	Value of work bonus tenders — oil and gas

36	Figure 13.	Wells drilled
37	Figure 14.	Depth drilled
44	Figure 15.	Exploration activity — geological crew months — land seismic crew months
45	Figure 16.	Exploration activity — seismic line miles
49	Figure 17.	Oil and gas exploration expenditures submitted for work credits
55	Figure 18.	Wells completed or abandoned in 1975 — west central N.W.T. (map)
56	Figure 19.	Wells completed or abandoned in 1975 — Mackenzie Delta (map)
57	Figure 20.	Wells completed or abandoned in 1975 — Western Arctic Islands (map)
58	Figure 21.	Wells completed or abandoned in 1975 — Queen Elizabeth Islands (map)
59	Figure 22.	Airstrips in the Queen Elizabeth Islands
62	Figure 23.	District boundaries

## Photographs

<i>Frontispiece</i>	Satellite photograph of Sabine Peninsula, Melville Island
17	Photo 1. Aerial view of man-made island, Netserk
35	Photo 2. Panarctic Tenneco et al W. Hecla N-52 gas well drilled from an ice-island
39	Photo 3. Shell Kugpik O-13 oil discovery well in the Mackenzie Delta
46	Photo 4. Tug pushing flotilla of barges in the Mackenzie River near Bar-C base camp
47	Photo 5. Barges of equipment being unloaded on the banks of the Mackenzie River
53	Photo 6. Construction of man-made island, Netserk, using clamshell cranes

# Introduction

This report covers oil and gas activities North of 60 for the year 1975. All aspects of these operations in the Yukon and Northwest Territories are administered by the Oil and Minerals Division, Department of Indian and Northern Affairs. It is the intent of the Department to provide for the orderly exploration and exploitation of oil and gas, thereby achieving local benefits to the specific areas involved as well as benefitting the people of Canada in general through the revenues accruing to the Crown.

As of March 1, 1976 the Minister and departmental officers responsible for the administration of oil and gas resources in the Northwest Territories, Yukon Territory and the northern offshore areas were:

Minister — The Honourable Judd Buchanan  
Deputy Minister — Arthur Kroeger  
Assistant Deputy Minister (Northern Affairs) —  
E. M. R. Cotterill  
Director, Northern Natural Resources and  
Environment Branch — F. J. Joyce  
Assistant Director, Oil and Minerals Division —  
Dr. H. W. Woodward

## Oil and Gas Land Section

Administrator, Oil and Gas — P. Sullivan  
Head, Land Unit — J. Barrett  
Head, Production and Royalty Accounting Unit —  
R. J. Marshall

## Oil and Gas Geology and Operations Section

Head, Geological Operations Unit — S. A. Kanik  
Head, Geological Evaluation Unit — S. A. Kanik  
(Acting)

## Oil and Gas Drilling and Conservation Section

Chief Petroleum Engineer — T. Boisvert  
Head, Drilling and Completion Engineering Unit —  
M. K. El-Defrawy  
Head, Offshore Petroleum Engineering Unit —  
L. Franklin  
Head, Production Systems Engineering Unit —  
R. L. Price  
Head, Reservoir Engineering Unit — T. Baker  
Regional Oil and Gas Conservation Engineer,  
N. W. T. (Yellowknife) — M. D. Thomas  
Regional Oil and Gas Conservation Engineer, Y.T.  
(Whitehorse) — A. F. Halcrow

District Oil and Gas Conservation Engineer

- for Arctic Islands, District 1, N.W.T.,  
(in Yellowknife) — B. Berry
- for Southern Sector — N.W.T., District 2, N.W.T.,  
in (Yellowknife) — appointment pending
- for N.W. Sector — N.W.T., District 3, N.W.T.,  
(in Inuvik) — D. Whitehead



# Summary

Oil and gas exploration and development activities continued throughout 1975 in the sedimentary formations of Canada's vast and geologically complex area North of 60. Oil was found in the Mackenzie Delta and on Cameron Island, and gas discoveries were again made in the Delta and on Melville Island. Because so much of this area still remains to be explored in detail, no meaningful estimate of its oil and gas reserves can be given at present.

Gas from the Pointed Mountain Field in the Northwest Territories and from the Beaver River Field that straddles the Yukon-British Columbia boundary continues to be transported to the Clarke Lake gas plant at Fort Nelson, B.C. for processing. A proposal has been submitted for the development of the gas reserves in the Mackenzie Delta and construction of three processing plants there — these developments to be undertaken currently with the building of a Mackenzie Valley Pipeline.

Oil from the Norman Wells Field — at present the only northern oil field in production — is processed locally at the refinery operated by Imperial Oil Limited. This is the only Canadian refinery North of 60 and its facilities have been and will continue to be upgraded to permit the handling of larger amounts of crude and the utilization of heavy ends that previously had to be flared.

A new Management Regime is to be established for all Canada Oil and Gas Lands and until this is approved, no disposal of Crown Lands will be made. No new permits or leases have been granted since 1972, but, under the discretionary renewal provision of the Regulations, a certain acreage was allowed to remain under permit on the basis of intensive drilling and assessment programs. Both the number of permits and the area covered by these declined slightly in 1975 but on the whole the situation remained fairly stable. No sales of oil or gas rights have been authorized since 1969.

A new Act and several new regulations for regulating oil and gas exploration, drilling and development is expected to be promulgated in 1976. They include: The Petroleum and Natural Gas Act; Canada Oil and Gas Geophysical Regulations (to be promulgated under the Canada Oil and Gas Production and Conservation Act); Canada Oil and Gas Drilling Regulations; Canada Oil and Gas Production Regulations; and the Canada Oil and Gas Land Regulations.

The revenues accruing to the Government from oil and gas rights showed an increase over the 1974 totals in both the fiscal and calendar year. Expenditures by Industry showed approximately a 17% increase for the same period. However, they are expected to rise appreciably if, as is anticipated, additional permits and leases are again issued and if the proposed offshore drilling in the Beaufort Sea is authorized.

Drilling operations were again carried out on land although the number and depths of wells drilled declined from the 1974 level. Approximately 75% of the footage drilled was exploratory. Offshore drilling from man-made ice islands was continued in the Archipelago, and in the shallow waters of the southern Beaufort Sea drilling operations were successfully carried out from constructed islands. Similar islands are to be constructed in 1976 by both the Sun Company and Imperial Oil Limited, the latter company planning to use a powerful suction barge in these operations. Such island-building is not considered feasible in the deeper water of the Beaufort Sea — the area considered at present to be a most probable location for major oil and gas discoveries. It is therefore, planned that the exploration drilling there, scheduled to begin in 1976 if authority is granted, will be done from ice-reinforced drillships. Because of the location and the equipment required, these will be the most costly wells ever drilled anywhere. Exploratory samples of the seabed in the area were taken during the summer of 1975.

Although geological, photogeological and seismic surveys continued on land, it was on a decreased scale of activity from that of the previous year. The decrease in seismic surveys is particularly important as it tends to forecast a decrease in drilling activity in 1976. Marine seismic surveys were carried out in Davis Strait, Baffin Bay, Lancaster Sound and the inter-island waters of the Archipelago. To aid future operations, the all-weather airstrip at Coppermine was expanded, and a contract was drawn up between the federal government and the Lockheed Aircraft Corporation to have a polar-orbiting satellite in operation by 1978 to provide information on the location of icebergs relative to drilling rigs, and to report on weather, sea conditions, and ice conditions generally.

Applications for permission to build a gas pipeline from the Western Arctic were filed in 1975 by Canadian Arctic Gas Pipeline Ltd. and by Foothills Pipe Lines Ltd. Research is being carried on by the Polar Gas Project in preparation for the filing in 1977 of an application to build a pipeline to transport gas from the Arctic Islands. An application is expected to be submitted in 1977 by the Beaufort-Delta Oil Project Limited for authority to build a feeder and trunk system to carry oil from the Beaufort Sea and Mackenzie Delta should suffice reserves be discovered there. The first sale of Mackenzie Delta gas has been negotiated by TransCanada Pipe Lines Limited with Imperial Oil Limited.

In addition to the programs of the Arctic Petroleum Operators Association, approximately fifteen participation and research projects were initiated or continued during 1975.



# Geological Summaries

In Canada, north of latitude 60°N, the land areas lying beyond provincial boundaries cover 3,778,233 square kilometres (1,458,784 square miles). Of this, a total of 1,204,344 square kilometres (465,000 square miles) are underlain by sedimentary rocks (Figure 1). This vast sedimentary region, which also includes the underwater extensions of these rock formations, is divided for convenience into 13 major geological provinces, each briefly described below. A selected list of reference material is provided in Appendix V.

## 1. Arctic Stable Platform

The Arctic Stable Platform lies between the Precambrian Shield to the south and the Franklinian geosyncline to the north and west. The area is underlain by thin, gently dipping, relatively undisturbed, Lower Paleozoic carbonates that overlie the craton and thicken northward from the Shield. They divide the Lowlands into several individual basins, Foxe Basin being the one farthest to the east. To the end of 1975, four unsuccessful tests had been drilled within the Arctic Stable Platform Province.

## 2. Franklinian Geosyncline (Arctic Fold Belt)

The limits of Paleozoic deformation define the division between the Franklinian geosyncline and the Arctic Lowlands to the south and east. The geosyncline was the site of continuous sedimentation from Cambrian to Upper Devonian time. Two depositional belts are recognized; a miogeosynclinal belt extending from Banks Island to northern Greenland, and a eugeosynclinal belt exposed only on Axel Heiberg and Ellesmere Islands. Thick carbonates and clastics constitute potential reservoirs. Strata were folded in the Ellesmerian orogeny of Late Devonian or Early Carboniferous time; these folded strata constitute the basement underlying the Sverdrup Basin. No commercial production of oil or gas has been discovered to date although encouraging shows of light gravity crude were recovered from wells on Cameron Island.

## 3. Sverdrup Basin

A major angular unconformity marks the base of the Sverdrup Basin stratigraphic succession; Lower Pennsylvanian to Tertiary strata overlie folded Paleozoic strata of the Franklinian geosyncline. The structural and stratigraphic axis of the Sverdrup Basin strikes northeast from Banks Island to northern Ellesmere Island and the thickest accumulation of sediments in the basin, in excess of 7,600 metres, is found along this axis. The sediments, which contain

a number of unconformities thin in all directions away from this axis. The sedimentary accumulation thus has the form of an elongate basin in both a structural and a stratigraphic sense. Thicknesses and facies indicate that the present south and east limits of the basin are close to the original depositional limits. Tertiary strata of the Arctic Coastal Plain mask the northern and western margins, evaporites of late Paleozoic age form piercement structures in the axial area. The lower part of the Upper Cretaceous series and older sediments are intruded by igneous sills and dykes of varying thickness, the igneous activity being concentrated in the eastern half of the basin. The Eureka Orogeny in latest Cretaceous and early Tertiary time produced folding and faulting throughout the basin and deformation was accompanied by emplacement or reactivation of the piercement bodies. The magnitude of the deformation increases toward the northeast margin of the basin. Thick arenaceous sequences, particularly in the Jurassic and Triassic, contain hydrocarbon reserves. Six gas fields have been discovered to date within the Sverdrup Basin. In chronological order of discovery they are: Drake Point; King Christian; Kristoffer Bay; Hecla; Wallis; and Thor. Recoveries of crude oil have been recorded from Ellesmere, Thor, Cameron and Melville Islands.

## 4. Arctic Coastal Plain

The north and west margins of the Sverdrup Basin, both on land and offshore, are masked by thick, relatively undisturbed Tertiary and Pleistocene clastics. Beds dip gently toward, and thicken on, the continental shelf and slope. In this area the continental shelf is approximately 161 kilometres wide. The continental slope is approximately the same width and lies at between 600 and 3,000 metres water depth inshore of the Canada Basin beyond Beaufort Sea in the Arctic Ocean. Mesozoic strata, underlying the Tertiary and Pleistocene clastics, have an untested potential. In this area the permanent ice cover on the Arctic Ocean has hindered exploration. The thick sequence of clastics of the coastal plain and the thicker offshore equivalents must be considered as having a high potential for hydrocarbon accumulation.

## 5. Baffin Bay/Davis Strait Basin

The Baffin Bay/Davis Strait basinal area lies entirely offshore and has been explored to date only by regional geophysical surveys. Several theories to explain the origin of the basin have been advanced:



**Fig.1**  
**GEOLOGICAL PROVINCES**  
 SCALE OF MILES  
 0 100 200 300



a widely accepted one involves continental drift by which Greenland and the Baffin land mass pivoted apart around a point located somewhere to the northwest. Geophysical surveys have demonstrated that the basin is underlain by an oceanic crust, that there is apparently no mid-basin ridge, and that as much as 7,600 metres of semi-consolidated clastics are present. Sediments thin to zero in nearshore areas and on the Davis Strait Sill and rocks outcropping around the basin margins are predominantly Precambrian. Major centres of deposition are the Thule Basin off Greenland, the Lancaster Delta and the Cumberland Delta. The central portion of the basin is underlain by up to 7,600 metres of flat-lying, relatively undisturbed sediments. Lancaster Sound and Jones Sound are structurally controlled grabens in which thick deltaic clastics accumulated. The sediment source area was to the west and a major Tertiary drainage system transported sediment to the basin. The large volume of geologically young sediments and the presence of favourable trapping conditions for hydrocarbons make the Baffin Bay/Davis Strait area a favourable one for future hydrocarbon production.

## **6. Banks Basin**

The Banks Basin occupies the central and west-central part of Banks Island and the adjacent coastal plains. Tertiary and Cretaceous clastics overlie mainly Lower and Middle Devonian sediments over much of the area. Proterozoic rocks of the Minto Arch occur at the southernmost tip. The sediments of the Banks Basin have not yet been adequately tested by drilling but the presence of large volumes of young sediments and the reefal facies of the Siluro-Ordovician carbonates make the area one of high potential for hydrocarbon accumulation.

## **7. Mackenzie-Beaufort Basin**

The Mackenzie Delta/Beaufort Sea petroleum province is made up of thick deposits of potentially productive Cretaceous and Tertiary sands.

*The Mackenzie Delta*, the southern portion of the Mackenzie-Beaufort Basin, is bounded by the Romanzof uplift to the southwest, the Richardson Mountains to the south, the Aklavik Arch to the southeast and the Arctic Ocean to the north. The Beaufort Sea is one of several formally named, marginal embayments with wide continental shelves that occur as indentations in the coastline of the Arctic Ocean. The Coastal Plain, which lies adjacent to the Beaufort Sea, is laterally continuous with the continental shelf and is considered as the onshore, exposed extension of the Beaufort Sea shelf. *The Beaufort Sea petroleum province* is connected to the mainland through the Yukon Coastal Plain and the Mackenzie Coastal Plain, and to Banks Island through the Banks Coastal Plain.

Growth faults extend seaward from the Mackenzie Delta across the coastal plain. Potential reservoir rocks, which include non-marine and marine sandstones and carbonate rocks, are transitional with shales that are potential source rocks.

Oil has been found in Paleozoic carbonates, Lower Cretaceous sands and Tertiary sands at Mayogiak, Atkinson, Kugpik, Ivik, Adgo, Kumak, Niglintgak, and Garry pools in the Mackenzie Delta.

Gas has been found in Cretaceous and Tertiary sands at Mallik, Niglintgak, Parsons, Taglu, Ya Ya, Reindeer, Titalik, Adgo, Kumak and Garry pools, also in the Mackenzie Delta.

## **8. Interior Plains**

### **a) Great Slave Plain**

The Great Slave Plain encompasses an area extending westward from Great Slave Lake to the Liard Plateau and Mackenzie Mountains. Underlying strata are mainly of Devonian age, obscured in part by remnants of a thick Cretaceous cover. The total sediments wedge in thickness from zero in the east to more than 3,000 metres in the west. Gas pools are found at Bovie Lake, Cameron Hills, Celibeta, Netla, Rabbit Lake, South Island River and Trainor Lake. The gas occurs in porous dolomites and limestones of Middle Devonian age.

### **b) Great Bear Plain**

The Great Bear Plain consists of Lower and Upper Cretaceous sediments partially covering a bedrock of Ordovician to Devonian age. The total thickness of the sediments wedges from zero in the east to more than 1,800 metres in the west along the eastern edge of the Franklin Mountains.

### **c) Anderson Plain**

The Anderson Plain lies east of the Mackenzie Delta. Cretaceous beds cover much of the Plain area and lie unconformably on Lower and Middle Paleozoic beds. Sediments more than 2,400 metres thick occur in a southwest-northeast trend through the wells C.P.O.G. Kugaluk N-02 and Elf Horton River G-02. Hydrocarbon shows have been encountered in the Cretaceous deposits.

### **d) Mackenzie Plain**

The Mackenzie Plain lies between the Franklin and Mackenzie Mountains. Cretaceous beds lie unconformably on Lower and Middle Paleozoic beds. Sediments range in thickness from 1,200 metres to 2,700 metres. Oil is produced in the Mackenzie Plain at Norman Wells, the producing formation being the Devonian Kee Scarp. Additional hydrocarbon shows have been encountered in the Cretaceous and Silurian.

### **e) Peel Plain**

The Peel Plain lies northeast of the Peel Plateau and northwest of the Mackenzie Plain. It is covered by Cretaceous and Jurassic sediments which overlie Paleozoic carbonates and shales. The sediments are similar to those of the Mackenzie Plain and range in thickness from more than 4,200 metres in the southwest to 2,400 metres in the northeast. Hydrocarbon shows have been encountered in the Lower Devonian.

### 9. Liard Plateau and Range

The Liard Plateau and Range lie west of the southern portion of the Great Slave Plain and northwest of the Fort Nelson Lowland. A thin Cretaceous cover lies unconformably on Paleozoic beds. Sediment thickness exceeds 3,000 metres. The Beaver River and Pointed Mountain fields produce gas from dolomites of the Nahanni Formation of Middle Devonian Age. Current production in the Beaver River field in the Yukon is from Mississippian sands. Production comes from large faulted anticlines near the western edge of the Great Slave Plain.

### 10. Eagle Plain

The Eagle Plain basin is contained between the Ogilvie and Richardson Mountains, with sediments approaching 6,100 metres in thickness, of which about 3,000 metres are late Paleozoic to Mesozoic in age, the remainder being Cenozoic. The basin has been tectonically altered.

Oil has been found in Pennsylvanian sand at the Chance Pool, and gas in Cretaceous sands at the Chance, Birch and Blackie pools. Hydrocarbon shows were also encountered in Mississippian, Devonian and Ordovician beds.

### 11. Peel Plateau

The Peel Plateau is bounded on the northwest and east by the Peel Plain, on the south by the Mackenzie Mountains, and on the west by the Richardson Mountains. The Plateau is covered by Tertiary and Cretaceous clastics unconformably overlying Paleozoic shales and carbonates. The sediments range in thickness from 3,000 metres in the east to 6,100 metres in the west. Shows of hydrocarbons have been encountered in Cretaceous and Middle Devonian strata.

### 12. Old Crow Basin

The Old Crow Basin (shown on map, Figure 1, as "Old Crow Plain") is a relatively unexplored intermontaine basin covering an area of about 6,200 square kilometres centered about latitude 68°N and longitude 140°W. Geophysical data indicates a thickness of from 600 to 1,500 metres of Mesozoic and Tertiary clastics overlying as much as 3,000 metres of Upper Devonian to Permo-Carboniferous sediments. The Old Crow Basin as it now exists was formed by the Laramide orogeny in Tertiary time.

### 13. Whitehorse Basin

The Whitehorse Basin lies at the northern end of the Central Cordilleran Geosyncline. It is about 240 kilometres long and 110 kilometres wide and contains up to 4,600 metres of sediments ranging in age from early Cretaceous to Late Triassic.

### 14. Area and Volume of Sediments

A comparison of the area and volume of sediments in the Western Provinces, the Yukon, the Northwest Territories and the Arctic Islands is given to Table 1.

**Table 1 — Area and Volume of Sediments**

Region	Total Area (Sq. Miles)	Volume of Sediments (Cu. Miles)	Total Area (Sq. Kilometres)	Volume of Sediments (Cu. Kilometres)
Manitoba and Saskatchewan	220,000	165,000	570,000	688,000
Alberta	224,700	333,400	582,000	1,390,000
British Columbia	138,500	298,000	359,000	1,242,000
Yukon and Northwest Territories				
Mainland*	541,500	421,000	1,402,000	1,755,000
Arctic Archipelago**	644,600	1,275,000	1,670,000	5,314,000
	1,769,300	2,492,400	4,582,000	10,389,000

\*Includes Beaufort Sea area, but excludes all Arctic Stable Platform.

\*\*Includes all Arctic Stable Platform and all offshore areas except Beaufort Sea.



# Oil and Gas Activities

Table 2 gives a complete list of the oil and gas discoveries North of 60 to the end of 1975.

Oil was discovered in the Delta in 1975 by Sun at Garry P-04, and in the Arctic Islands by Panarctic at Bent Horn F-72A on Cameron Island.

Gas discoveries in 1975 were made in the Mackenzie

Delta by Shell at Kumak K-16 and by Sun at Garry P-04. Gas was recovered in the Arctic Islands by Panarctic at Drake D-73, East Drake I-55, East Hecla C-32, and West Hecla P-62.

Figure 2 shows the location of all oil and gas fields, including the 1975 discoveries.

**Table 2 — Oil and gas discoveries North of 60 to end of 1975 (\*indicates discovery/recovery in 1975)**

Well Name	Location	Well Status	Reserve Status	Horizon	Lithology	Spud Date	Completion Date	Potential
<b>Northwest Territories — Arctic Islands</b>								
<b>Crude Oil Discoveries</b>								
<i>Ellesmere Is.</i>								
Panarctic Romulus C-42	C-42-80-00-84-00	Suspended	Oil & Gas Show	Jurassic Schei Point Bjorne	Sandstone	29-01-72	25-07-72	Area has potential
<i>Thor Island</i>								
Panarctic et al Thor P-38	P-38-78-10-103-00	Suspended	Oil Show	Heiberg	Sandstone	06-04-72	10-05-72	Thin Oil leg on water
<i>Cameron Island</i>								
Panarctic et al Bent Horn N-72	N-72-76-30-103-30	Potential Oil & Gas Well	Oil Show	Blue Fiord	Carbonate	24-11-73	06-04-74	500 BOPD on test
*Panarctic et al Bent Horn F-72A	F-72-76-30-103-30	Potential Oil & Gas Well	Oil Show	—	—	21-05-75	19-12-75	—
<b>Gas Discoveries</b>								
<i>Melville Island</i>								
Panarctic Drake Point N-67	N-67 76-30-108-30	Abandoned	Gas Discovery	Jurassic	Sandstone	14-04-69	02-09-69	Abandoned after blowout
Panarctic Drake Point L-67	L-67-76-30-108-30	Potential Dual Gas	Gas Dev.	Jurassic Bjorne	Sandstone	28-09-69	26-02-70	DST 10 MMCF (Jurassic)
Panarctic et al Drake F-16	F-16-76-30-108-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	10-05-72	16-06-72	AOF 265 MMCFD
Panarctic et al Drake B-44	B-44-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	23-09-72	22-10-72	DST 5.5 MMCFD
Panarctic et al Drake D-68	D-68-76-30-108-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	07-06-73	25-03-74	DST 8.7 MMCFD
				Bjorne	Sandstone			DST 40.1 MCFD
Panarctic et al Drake E-78	E-78-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	02-05-74	27-05-74	DST 4.8 MMCFD
*Drake D-73	D-73-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	23-04-75	10-05-75	DST 8.1 MMCFD

**Table 2 — Continued**

Well Name	Location	Well Status	Reserve Status	Horizon	Lithology	Spud Date	Completion Date	Potential
Panarctic et al East	I-55-76-	Potential	Gas Dev.	Jurassic	Sand-	06-03-75	16-04-75	AOF 58 MMCFD
*Drake I-55	30-107-30	Gas			stone			critical flow prover
Panarctic et al	N-52-76-	Potential	Gas Dev.	Jurassic	Sand-	05-03-74	15-04-74	AOF 52 MMCFD
W. Hecla N-52	30-110-30	Gas			stone			
Panarctic et al E.	F-62-76-	Potential	Gas	Jurassic	Sand-	11-11-72	12-12-72	AOF 96 MMCFD
Hecla F-62	30-110-00	Gas	Discovery		stone			
Panarctic et al	I-69-76-	Potential	Gas Dev.	Jurassic	Sand-	22-02-73	11-04-73	DST 7.8 MMCFD
Hecla I-69	20-110-00	Gas			stone			
Panarctic et al	C-32-76-	Potential	Gas	—	—	07-11-75	10-12-75	—
*E. Hecla C-32	30-110-00	Gas	Discovery					
Panarctic et al	P-62-76-	Potential	Gas Dev.	Jurassic	Sand-	07-01-76	22-02-76	DST 5.3 MMCFD
*W. Hecla P-62	30-110-30	Gas			stone			
<i>Thor Island</i>								
Panarctic et al	H-28-78-	Potential	Gas Dev.	Heiberg	Sand-	28-02-73	10-05-73	Flow test to
Thor H-28	10-103-00	Gas			stone			55 MMCFD
<i>Ellef Ringnes Island</i>								
Panarctic et al	B-06-78-	Potential	Gas	Heiberg	Sand-	09-11-71	17-03-72	DST 10 MMCFD
Kristoffer Bay B-06	20-102-30	Gas	Discovery		stone			
<i>King Christian Island</i>								
Panarctic King	D-18-77-	Abandoned	Gas	Heiberg	Sand-	14-10-70	25-01-71	Abandoned
Christian D-18	50-101-00		Discovery		stone			after blowout
Panarctic King	D-18-77-	Potential	Gas Dev.	Heiberg	Sand-	26-11-70	15-03-71	AOF 264
Christian D-18A	50-101-00	Gas			stone			MMCFD
Panarctic et al	N-06-77-	Potential	Gas Dev.	Heiberg	Sand-	13-05-71	20-09-71	AOF 340
King Christian N-06	50-101-00	Gas			stone			MMCFD
Dome Arctic	K-62-78-	Potential	Gas	Heiberg	Sand-	27-11-72	21-02-73	DST 12.43
Ventures	00-102-00	Gas	Discovery		stone			MMCFD
Wallis K-62								
<b>Northwest Territories — Mainland</b>								
<b>Crude Oil Discoveries</b>								
<i>Norman Wells Oil Field</i>								
Northwest	P-37-65-	Abandoned	Oil	Devonian	Fractured	14-04-20	1923	12 bbl/day
Discovery No. 1	20-126-45		Discovery	Canol	Shale			
Northwest	P-37-65-	Abandoned	Oil	Kee Scarp	Lime-	7-24	8-24	75 bbl/day
Discovery No. 2	20-126-45		Discovery	(Givetian)	stone			
74 additional wells were drilled to develop field								
<i>Mackenzie Delta — Tuktoyaktuk Peninsula</i>								
IOE Atkinson	H-25-69-	Abandoned	Potential	Lower	Sand	14-12-69	26-02-70	2000 BOPD
H-25	50-131-45		Oil Well	Cretaceous				calc.
								24.3° API
IOE Mayogiak	J-17-69-	Abandoned	Potential	Devonian &	Carbonate	03-04-71	06-08-71	9300' g.c. Oil
J-17	30-132-45		Oil Well	Lower	& Sand-			33.6° API
				Cretaceous	stone			
Imp. Ivik	J-26-69-	Suspended	Potential	Tertiary	Sand-	08-04-72	30-09-72	5345 BOPD
J-26	40-134-15		Oil & Gas		stone			calc.
			Well					24° API
Imp. Ivik	K-54-69-	Abandoned	Potential	Tertiary	Sand-	30-03-73	08-06-73	829 BOPD
K-54	40-134-15		Oil		stone			calc.
								24° API
Imp. Adgo	F-28-69-	Plugged &	Gas & Oil	Tertiary	Sand-	28-12-73	19-03-74	O.T.S., G.T.S.
F-28	30-135-45	Abandoned			stone			17.5° API
Shell	O-13-69-	Suspended	Oil	Lower	Sand-	26-03-73	30-09-73	G.T.S., O.T.S.
Kugpik 0-13	00-135-15			Cretaceous	stone			45.1° API
Shell	J-06-69-	Suspended	Oil	Tertiary	Sand-	24-11-73	01-05-74	O.T.S.
Kumak J-06	20-135-00				stone			27.1° API
Shell	M-19-69-	Suspended	Oil & Gas	Tertiary	Sand-	01-06-74	25-01-75	O.T.S.
Niglintgak M-19	20-135-15				stone			31-32° API
*Sun et al	P-04-69-	Suspended	Oil & Gas	—	—	25-08-75	05-01-76	—
Garry P-04	30-135-30							

Table 2 — Continued

Well Name	Location	Well Status	Reserve Status	Horizon	Lithology	Spud Date	Completion Date	Potential
<b>Northwest Territories — Mainland</b>								
<b>Gas Discoveries</b>								
<i>Mackenzie Delta — Tuktoyaktuk Peninsula</i>								
Gulf Mobil Parsons F-09	F-09-69-00-133-30	Suspended	Gas & Condensate	Lower Cretaceous	Sand	20-01-71	19-04-72	17.2 MMCFD DST
Gulf Mobil Parsons N-10	N-10-69-00-133-30	Suspended	Gas	Lower Cretaceous & Jurassic	Sand	14-02-73	29-05-73	FT 34 MMCFD
Gulf Mobil Parsons A-44	A-44-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sand	09-04-75	22-07-75	15 MMCFD DST
Gulf Mobil Parsons P-53	P-53-69-00-133-30	Suspended	Gas & Condensate	Lower Cretaceous	Sand	22-12-73	09-04-74	8.3 MMCFD DST
Gulf Mobil Parsons 0-27	0-27-69-00-133-30	Suspended	Gas	Cretaceous	Sand	23-03-74	30-08-74	
Gulf Imp. Shell Reindeer F-36	F-36-69-10-134-30	Suspended	Gas	Tertiary	Sandstone	13-03-73	05-06-73	4.87 MMCFD DST
Gulf Imp. Shell Titalik K-26	K-26-69-10-135-00	Abandoned	Gas Well (DST)	Tertiary	Sandstone	17-10-72	20-02-73	14.05 MMCFD DST
Gulf Mobil Ya Ya A-28	A-28-69-20-134-30	Suspended	Gas	Tertiary	Sandstone	28-02-74	06-07-74	
Gulf Mobil Ya Ya P-53	P-53-69-20-134-30	Suspended	Gas Well (DST)	Cretaceous	Sandstone	08-12-72	20-03-73	8.1 MMCFD DST
IOE Taglu G-33	G-33-69-30-134-45	Suspended	Gas Well	Tertiary	Sandstone	13-04-71	18-08-71	11.2 MMCFD DST
IOE Taglu C-42	C-42-69-30-134-45	Suspended	Condensate & Gas	Upper Cretaceous	Sandstone	30-04-72	18-11-72	24.5 MMCFD calc.
IOE Taglu W. P-03	P-03-69-30-135-00	Suspended	Gas	Upper Cretaceous	Sandstone	12-12-71	29-03-72	8.9 MMCFD Max. flow rate
IOE Taglu D-43	D-43-69-30-134-45	Suspended	Gas	Upper Cretaceous	Sandstone	23-03-73	11-09-73	AOF 30.3 MMCFD
IOE Mallik L-38	L-38-69-30-135-00	Abandoned	Potential Gas (DST)	Tertiary	Sandstone	24-12-71	05-04-72	8.84 MMCFD CCT. calc
*Shell Kumak K-16	K-16-69-20-135-00	Suspended	Gas Well	Tertiary	Sandstone	23-02-75	13-07-75	11.9 MMCFD DST
Shell Niglintgak H-30	H-30-69-20-135-15	Suspended	Gas Well (DST)	Tertiary	Sandstone	24-10-72	07-04-73	15.9 MMCFD DST
*Sun et al Garry P-04	P-04-69-30-135-30	Suspended	Oil & Gas	—	—	25-08-75	05-01-76	—
<i>Southern Mainland</i>								
Pan Am Pointed Mountain G-62	G-62-60-30-123-45	Gas Well	Gas Development	Middle Devonian Carbonate	Dolomite	09-07-68	23-06-69	Flow back 12 MMCFD
Pan Am Pointed Mountain K-45	K-45-60-30-123-45	Gas Well	Gas Development	Middle Devonian Carbonate	Dolomite	15-09-67	08-05-68	AOF 75.6 MMCFD
Pan Am Pointed Mountain 0-46	0-46-60-30-123-45	Gas Well	Gas Development	Devonian Nahanni	Dolomite	29-03-69	02-10-71 Extended Standby	AOF 19.43 MMCFD
Pan Am Pointed Mountain P-53	P-53-60-30-123-45	Gas Well	Gas Discovery	Devonian Nahanni	Dolomite	06-02-66	22-02-67	AOF 70.22 MMCFD
Amoco B-2 Pointed Mountain F-38	F-38-60-30-123-45	Gas Well	Gas Development	Devonian Nahanni	Dolomite	22-08-72	07-10-73	AOF 29 MMCFD
Amoco Pointed Mountain A-55	A-55-60-30-123-45	Gas Well	Gas Development	Devonian Nahanni	Dolomite	01-03-74	08-08-74	Production tested 4.5 MMCFD
Ashland et al Tedji Lake F-24	F-24-67-50-126-45	Suspended	Gas	Basal Cambrian	Sandstone	13-02--74	31-03-74	DST 4.5 MMCFD
Briggs Rabbit Lake No. 1	0-16-61-00-118-45	Potential Gas Well	Gas Discovery	Sulphur Point	Limestone	04-02-55	30-03-55	AOF 2 MMCFD (EST)
Briggs Rabbit Lake No. 2	B-07-61-00-118-45	Potential Gas Well	Gas Development	Sulphur Point	Limestone	09-02-57	14-03-57	AOF 6 MMCFD (EST)
C.P.O.G. et al La Biche F-08	F-08-60-40-124-30	Suspended	Gas Discovery	Middle Devonian	Argillaceous Limestone	25-02-71	19-03-71	DST 2.9 MMCFD



**Table 2 — Concluded**

Well Name	Location	Well Status	Reserve Status	Horizon	Lithology	Spud Date	Completion Date	Potential
Home Signal CSP Celibeta No. 2 H-78	H-78-60-10-122-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	26-12-59	24-03-60	AOF 8 MMCFD
H. B. Cameron Hills A-05	A-05-60-10-117-30	Potential Gas Well	Gas Discovery	Devonian	Carbonate	28-01-68	24-02-68	DST 8.2 MMCFD
H.B. Pan Am S. Island R. M-41	M-41-60-10-121-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	03-02-64	23-04-64	DST 5.7 MMCFD
H.B. Amoco S. Island R. M-52	M-52-60-10-121-00	Abandoned	Gas Development	Slave Point	Limestone	21-01-73	21-02-73	DST 1.3 MMCFD
Pacific Amoco Tathlina N-18	N-18-60-20-118-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	28-01-73	19-02-73	DST 1.8 MMCFD
Shell H.B. Grumbler G-63	G-63-60-20-115-45	Abandoned	Potential Gas Discovery	Slave Point	Carbonate	14-02-69	16-03-69	DST 10 MMCFD
Sun Netla C-07	C-07-60-50-122-45	Potential Gas Well	Gas Discovery	Sulphur Point	Carbonate	20-01-61	05-04-61	AOF 24 MMCFD
Texaco Bovie Lake J-72	J-72-60-10-122-45	Potential Gas Well	Gas Discovery	Nahanni	Limestone	06-01-70	18-01-70	DST 2.6 MMCFD
Union Pan Am Trainor C-39	C-39-60-20-120-30	Potential Gas Well	Gas Discovery	Sulphur Point	Carbonate	29-01-65	15-03-65	DST 8 MMCFD
<b>Yukon Territory Gas Discoveries</b>								
Canada Southern et al North Beaver YT I-27	I-27-60-10-124-00	Suspended	Extension Test Gas Well	Middle Devonian	Carbonate	24-03-63	29-09-64	AOF 1.5 MMCFD
Canoe River Chance YT J-19	J-19-66-10-137-30	Potential Gas & Oil	Gas & Oil Discovery	Chance and Permo Penn Alder	Sandstone & Limestone	14-12-67	17-02-68	DST 6.52 MMCFD
Pan Am Beaver River YT G-01	G-01-60-10-124-15	Gas Well	Gas Producer	Mississippian & Nahanni	Sandstone & Carbonate	12-06-68	10-03-69	AOF 6.77 MMCFD AOF 39.54 MMCFD
Socony Mobil WM Chance YT G-08	G-08-66-10-137-30	Potential Oil Well	Gas & Oil Discovery	Lower Cret.  Carboniferous Hart River	Sandstone  Sandstone	04-12-64	15-02-65	DST 3.3 MMCFD 1180' oil
Socony Mobil WM Birch YT B-34	B-34-66-10-136-45	Potential Gas Well	Gas Discovery	Carboniferous Hart River	Sandstone	04-08-64	06-08-65	DST 7.3 MMCFD
Socony Mobil WM Blackie YT No. 1 M-59	M-59-66-00-137-00	Potential Gas Well	Gas Discovery	erous Hart River Carbonif-Miss. Dev.	Sandstone	11-12-63	27-03-64	DST 2.8 MMCFD
WM Chance YT No. 1 M-08	M-08-60-10-137-30	Potential Gas or Oil Well	Gas & Oil Discovery	Cretaceous  Carboniferous Miss. Dev.	Sandstone  Sandstone	30-05-59	25-05-60	11/64" Choke 5 MMCFD 10.5 bbl/d

# Production, Reserves and Refining

## Production

Six gas wells in the *Pointed Mountain Gas Field*, G-62, K-45, O-46, P-53, F-38 and A-55 (in grid area 60-30-123-45) produced at a combined gross average rate of 84.7 MMCFD plus 324 BWPD for a yearly total of 33.100 BCF and 122,080 barrels of water. Three wells, Pointed Mountain G-62, Pointed Mountain F-38 and Amoco Pointed Mountain A-55 were tied into the gathering system during the year.

The *Beaver River Gas Field* straddles the Yukon-B.C. border with one well, Pan Am Beaver River Y.T. G-01 (in grid area 60-10-124-15) in the Yukon portion of the field. A total of 1.975 BCF was produced from the Mississippian formation in this well during 1975, at an average gross rate of 5.4 MMCFD. Under a royalty-sharing unitized-pool agreement between the British Columbia and the federal government, 7% of the total Nahanni formation production, or .768 BCF, was assigned to the Yukon portion of the field during the year.

The *Norman Wells Oil Field*, lying in the west central part of the N.W.T. had 59 oil wells capable of production in 1975, with 33 producing regularly. Total gross field production during the year averaged 2,944 BOPD plus 5.5 MMCFD of gas, for a yearly total of 1,074,713 barrels of oil and 2.027 BCF of gas.

Gas produced from the *Pointed Mountain Field* is transported via Westcoast Transmission to the Clarke Lake gas plant at Fort Nelson, B.C. Gas from the *Beaver River Field*, part of which underlies the Yukon, is also transported to the Clark Lake plant.

A submission was received from Industry in November 1974, for approval to develop the gas reserves of the Mackenzie Delta. Three gas processing plants with a combined capacity of 1.5 BCFD, are proposed for the Niglintgak, Parsons Lake, and Taglu gas fields, construction to be coincident with that of a Mackenzie Valley pipeline.

## Reserves

The oil and gas pools of the Northwest Territories and the Yukon Territory are only in the initial stages of exploration, and definitive reserves of oil and gas would, therefore, have limited meaning at present. Norman Wells is the sole field producing oil at this time. The field was discovered in 1920, but intensive commercial development did not take place until World War II. During 1975, oil was produced at an

average rate of 2,944 barrels daily and was refined locally.

The majority of established gas reserves in the Mackenzie Delta are located in the Taglu, Parsons Lake and Niglintgak gas fields. Further development drilling in the Sabine Peninsula, Melville Island, has extended the previous known limits of the Hecla and Drake gas fields.

## Refining

The only refinery located North of 60 is at Norman Wells and is operated by Imperial Oil Limited. It has a calendar day capacity of 3200 barrels. A continuing modernization program is underway to upgrade the refinery facilities. Construction of a new wharf loading area was completed in 1975 and additional tankage for storage of Bunker C fuels is being installed so that previously flared heavy ends can be marketed. All tankage is now fully dyked, minimizing the threat of oil spills in the area. In 1975, the refinery processed an average of 2720 barrels per day of locally produced crude oil.

Aerial View of man-made island, Netserk (*Courtesy Imperial Oil Ltd.*)





# Land Administration

On May 1, 1975, the Honourable Judd Buchanan announced that a new Management Regime would be established for Canada Oil and Gas Lands, and that all unalienated Canada Oil and Gas Lands would be considered Crown Reserves. Until the Management Regime is approved, no disposal of Crown Reserve Lands will be made. In July, 1975 applications for exploratory permits for some 125,000,000 acres in the north were rejected by the Minister.

On the whole, the inventory of permits and leases held by the Industry (Table 3 and Figures 3 and 4) North of 60 remained fairly stable. Table 3 reflects the numbers of issued permits and leases in good standing as of December 31, 1975. During 1975, the total of permits and leases declined by some 7.4%. This decline is due partly to the maturing of permits and partly to the evaluation of land holdings. The stability of the holdings continues to emphasize the continued interest in northern exploration, particularly as the majority of the holdings are subject to annual renewals at escalating rates. Based on intensive drilling and assessment programs, some 20,000,000 acres in the Mackenzie Delta and Arctic Islands were allowed to remain in permit under the discretionary renewal provision of the Regulations. During 1976 some 42,000,000 acres of permits will reach full maturity and it is likely that significant changes in the acreage holding patterns will then result.

Since 1972, discussions between the Maritime Provinces and the federal government respecting the development of the Atlantic near offshore have continued and, as a result, no new leases have been issued by the federal government from permits on Canada Lands. Lease applications for some 10,000,000 acres North of 60 have been received since 1972, 2,595,000 acres in 1975 alone. These applications are not included in either the permit or lease totals of Table 3.

**Table 3 — Number of issued permits and leases — with acreage — as of December 31, 1975**

Area	No. of Permits	Acreage	No. of Leases	Acreage
N.W.T. Mainland	1,493	67,040,730	555	3,319,506
Yukon Mainland	416	17,849,617	69	309,481
Arctic Islands	4,610	222,206,689	NIL	NIL
Arctic Coast Marine	1,075	51,796,130	NIL	NIL
	7,594	358,893,166	624	3,628,987

Total area under permit or lease 362,522,153 acres, down by 28,570,522 acres (7.3%) from 1974.

Figure 5 shows the extent of oil and gas holdings North of 60 during 1975.

Fig. 3  
**ACREAGE HELD UNDER OIL & GAS PERMIT**  
 YUKON TERRITORY AND NORTHWEST TERRITORIES

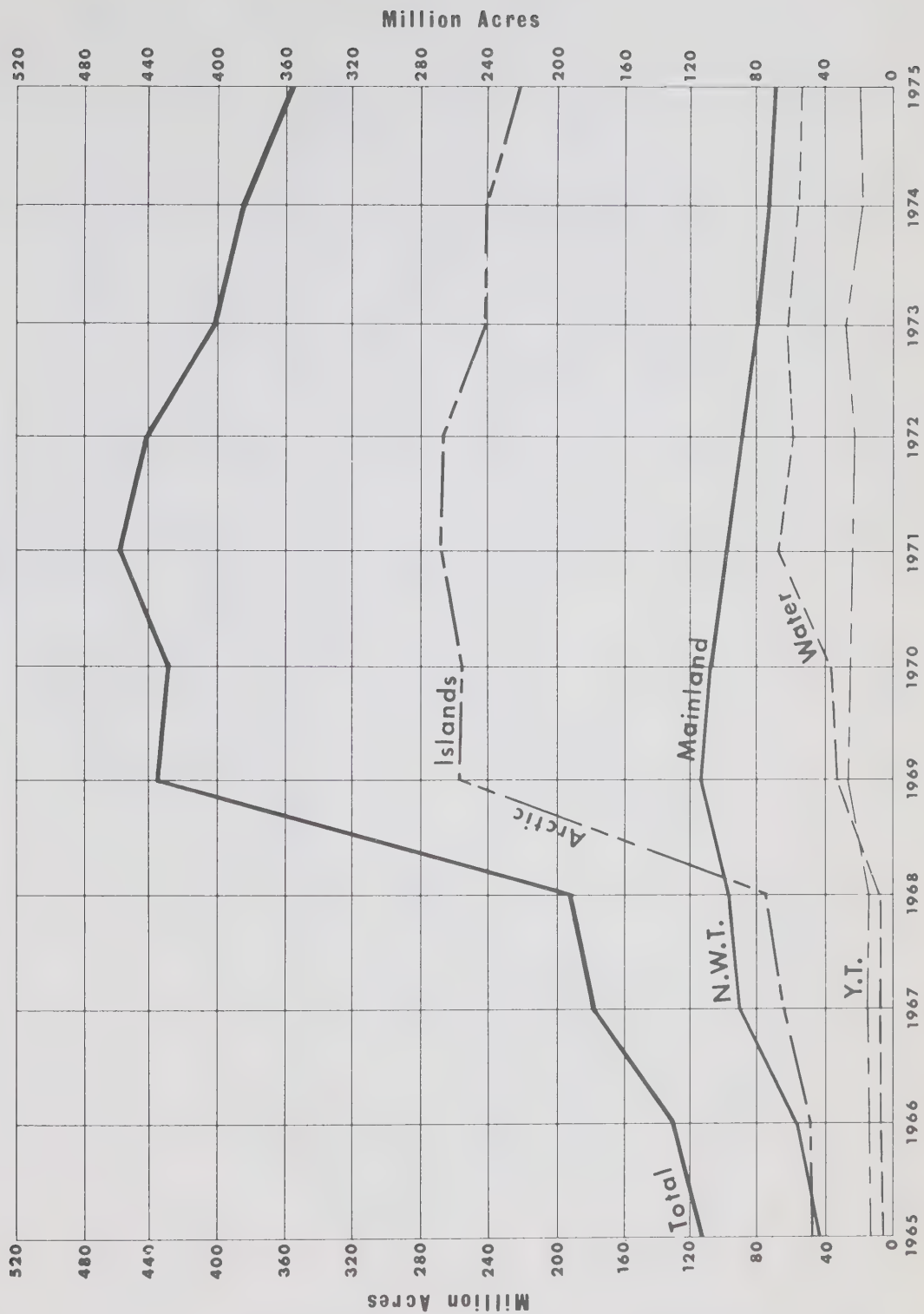
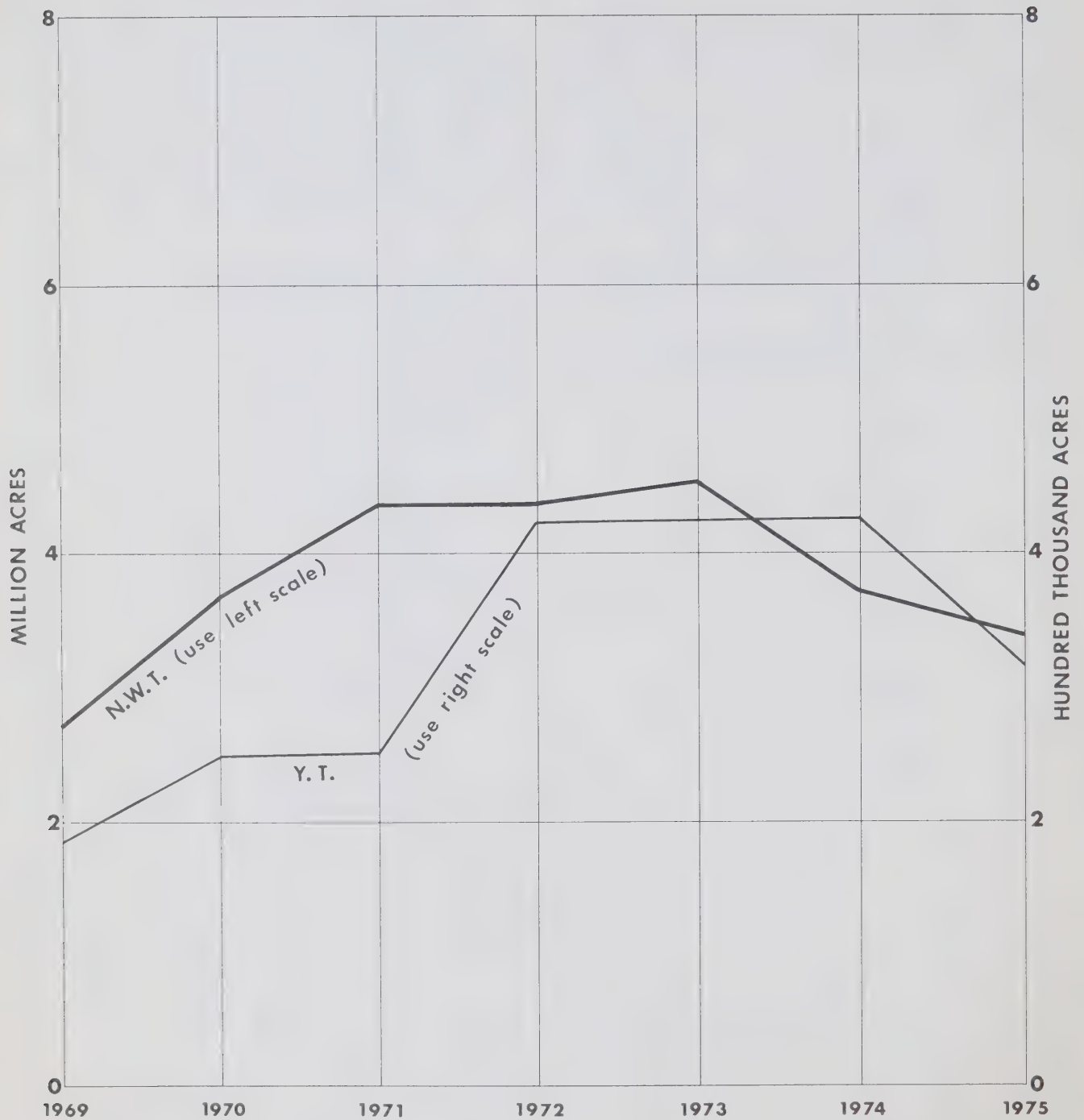
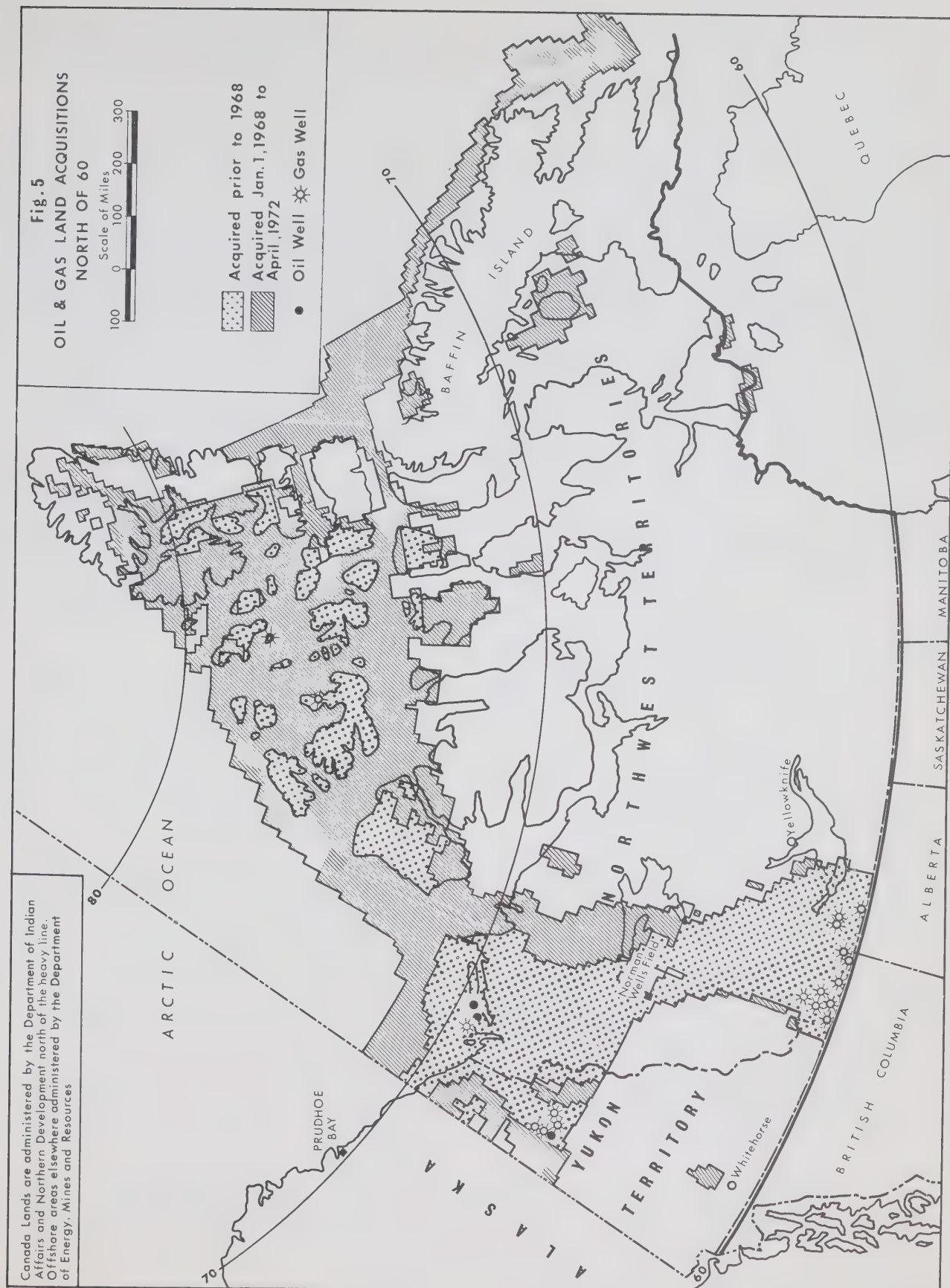


Fig. 4  
YUKON TERRITORY - NORTHWEST TERRITORIES  
ACREAGE UNDER LEASE  
BY YEAR







# Act and Regulations

## Petroleum and Natural Gas Act

On May 1, 1975, the Honourable Judd Buchanan in an address before the Independent Petroleum Association of Canada, announced the new Land Management Regime which will be legislated in 1976. Some of the points raised by the Minister included the implementation of the Universal Development Concept through a modified disposal method; increased participation by Canadians in the production stage through a profit sharing system; reduced exploratory tenure; and a new system of oil and gas licences requiring production for continued tenure.

All applications for permits under the current Regulations were rejected in July, 1975, by the Minister and all unalienated oil and gas rights were designated as Crown Reserves.

Extensive confidential discussions on alternative methods of implementing the new proposals were held with industry through 1975 and into 1976 with a view to making final legislative recommendations in 1976.

## Oil and Gas Land Regulations

The permit terms under the Canada Oil and Gas Land Regulations are summarized in Figures 6 and 7. Figure 6 shows the term in years, including the renewals granted additional to the initial term and the total per-acre-minimum-work requirements to be met during the maximum permit life. The minimum deposit and work requirements for each period of the permit life are illustrated in Figure 7.

Land Order 1-1961 revoked in May 1970, allowed a permittee, in consideration for the payment of extra royalty, an option for 60 days to select leases for any or all of the sections of his permit which revert to the Crown after his selection of primary leases. The additional royalty rates under that Order are shown for each area in Figure 8. Some 93 leases granted under the Order were in good standing on December 31, 1975.

Figure 9 shows diagrammatically the flow of Canada Oil and Gas Lands under the Regulations and through the various disposal methods.

## Land Use Regulations

In June, 1970, amendments to the Territorial Lands Act which permitted the implementation of Territorial Land Use Regulations were passed by Parliament.

These Regulations were promulgated on November 4, 1971. They provide authority for designating Land Management Zones in the Yukon Territory and Northwest Territories. Within these zones all land use operations, including resource exploration and development, require Land Use Permits which stipulate the measures to be followed by the operator to protect the terrain and ecosystems. Permit conditions are established on the recommendation of an inter-departmental and an inter-government Land Use Advisory Committee.

As a result of amendments to the Land Use Regulations, effective October 1975, development anywhere in the Northwest Territories requires land use permits. A new land-management zone covering the central Arctic mainland, Foxe Basin and Baffin Island has been established. Permits for the new areas will be issued by the Yellowknife office of the Department.

In the Northwest Territories, the Land Use Regulations are administered by the Regional Director of Resources and his staff in Yellowknife and Fort Smith, and in the Yukon Territory, by the Regional Director of Resources and his staff in Whitehorse. Exploration programs carried out in all offshore areas contiguous to the Northwest Territories are monitored by the Regional Director of Resources in Yellowknife.

## Canada Oil and Gas Geophysical Regulations

A joint project was initiated by the Departments of Indian and Northern Affairs (DINA) and Energy, Mines and Resources (DEMR) to draft the Canada Oil and Gas Geophysical Regulations for promulgation under the Canada Oil and Gas Production and Conservation Act. Sections of the regulations will pertain to onshore and offshore geophysical operations on Canada Lands.

The primary intent of these regulations will be to regulate:

- (a) The safety of personnel working on geophysical crews;
- (b) The protection of the living resources of the onshore and marine areas to be surveyed;
- (c) The quality and type of geophysical data submitted to the relevant resource organizations.

## Canada Oil and Gas Drilling Regulations

A further joint project was initiated by DINA and DEMR to draft the Canada Oil and Gas Drilling Regulations for promulgation under the Canada Oil

and Gas Conservation Act. Sections of the regulations pertaining to the drilling of both onshore and offshore wells were completed in draft form and reviewed with Industry during 1975 and early 1976. It is anticipated that the sections pertaining to drilling and titled "Canada Oil and Gas Drilling Regulations", will be promulgated in the second half of 1976.

#### **Canada Oil and Gas Production Regulations**

The drafting of sections of the regulations pertaining to production, pipelines, processing plants, and related facilities was initiated in late 1973. Sections pertaining to both onshore and offshore production were completed by DINA in 1974 in Draft form. It is anticipated that the joint DINA-DEMR draft regulations completed in 1975, will be sent to Industry for review and comments in 1976.



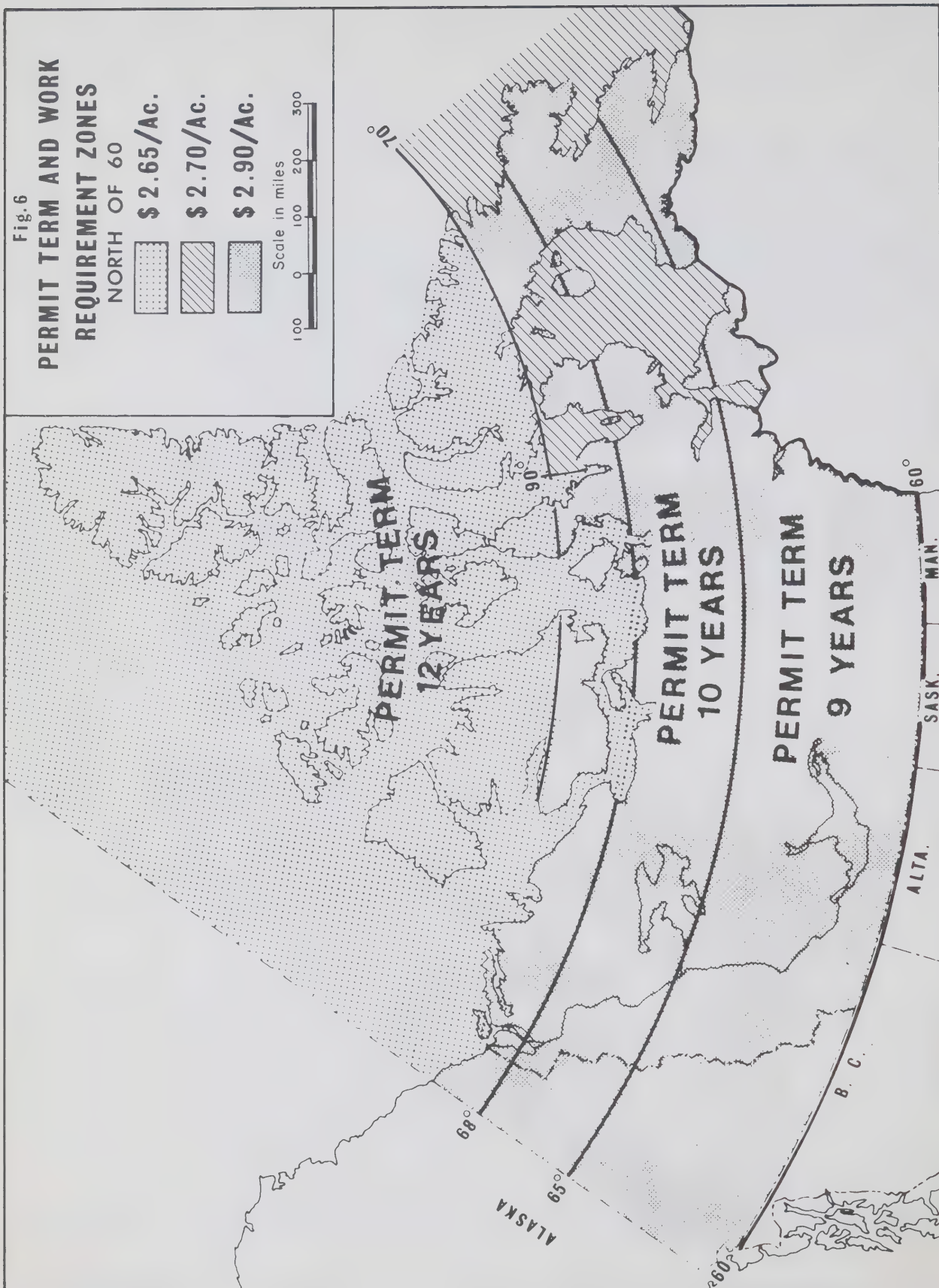


Fig. 7

YUKON TERRITORY - NORTHWEST TERRITORIES  
**PERMIT TERMS AND DEPOSIT REQUIREMENTS — PER ACRE**

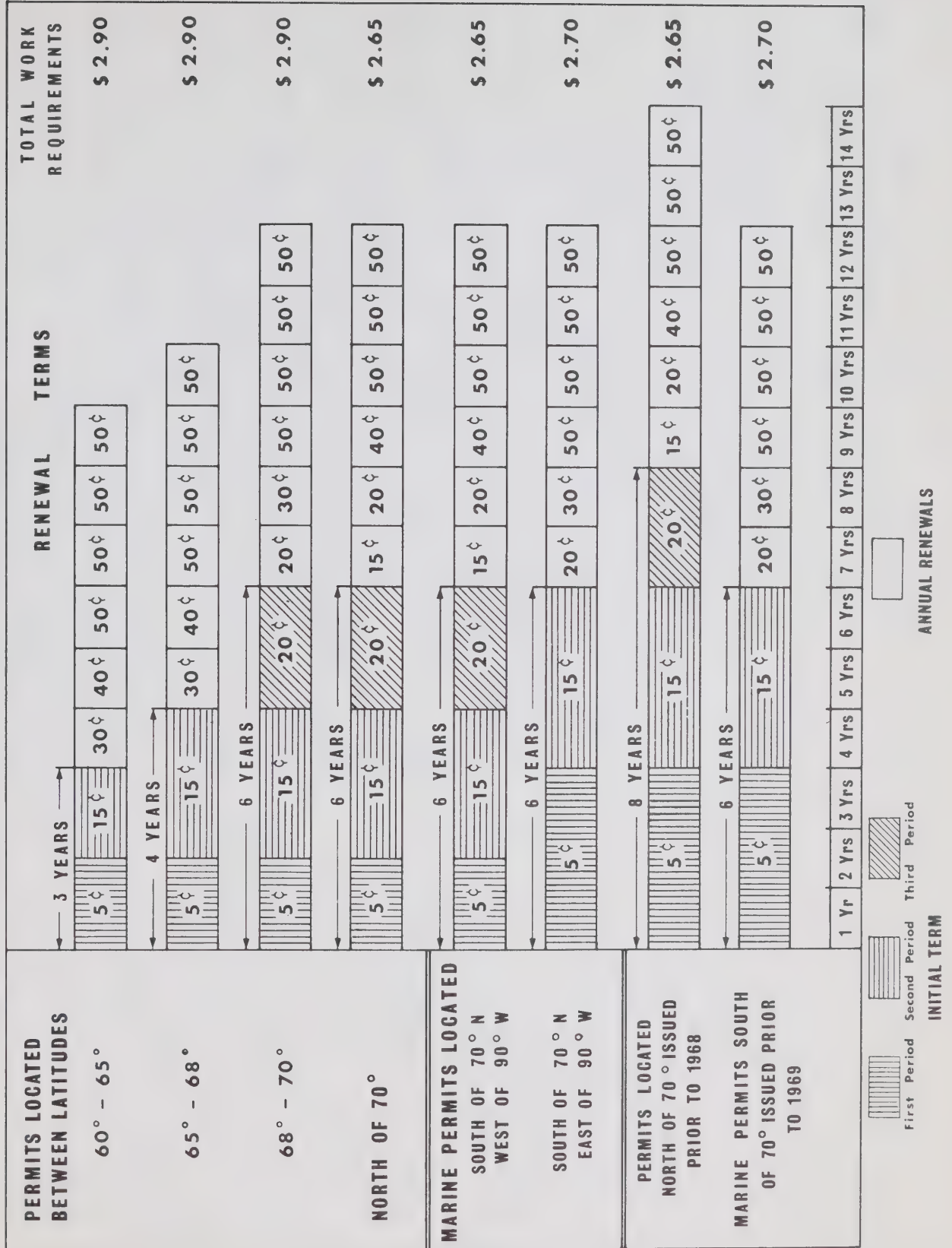


Fig. 8

# **ADDITIONAL ROYALTY RATES BY AREAS**

PRIOR TO REVOCATION  
OF LAND ORDER NO. 1-1961  
IN MAY 1970

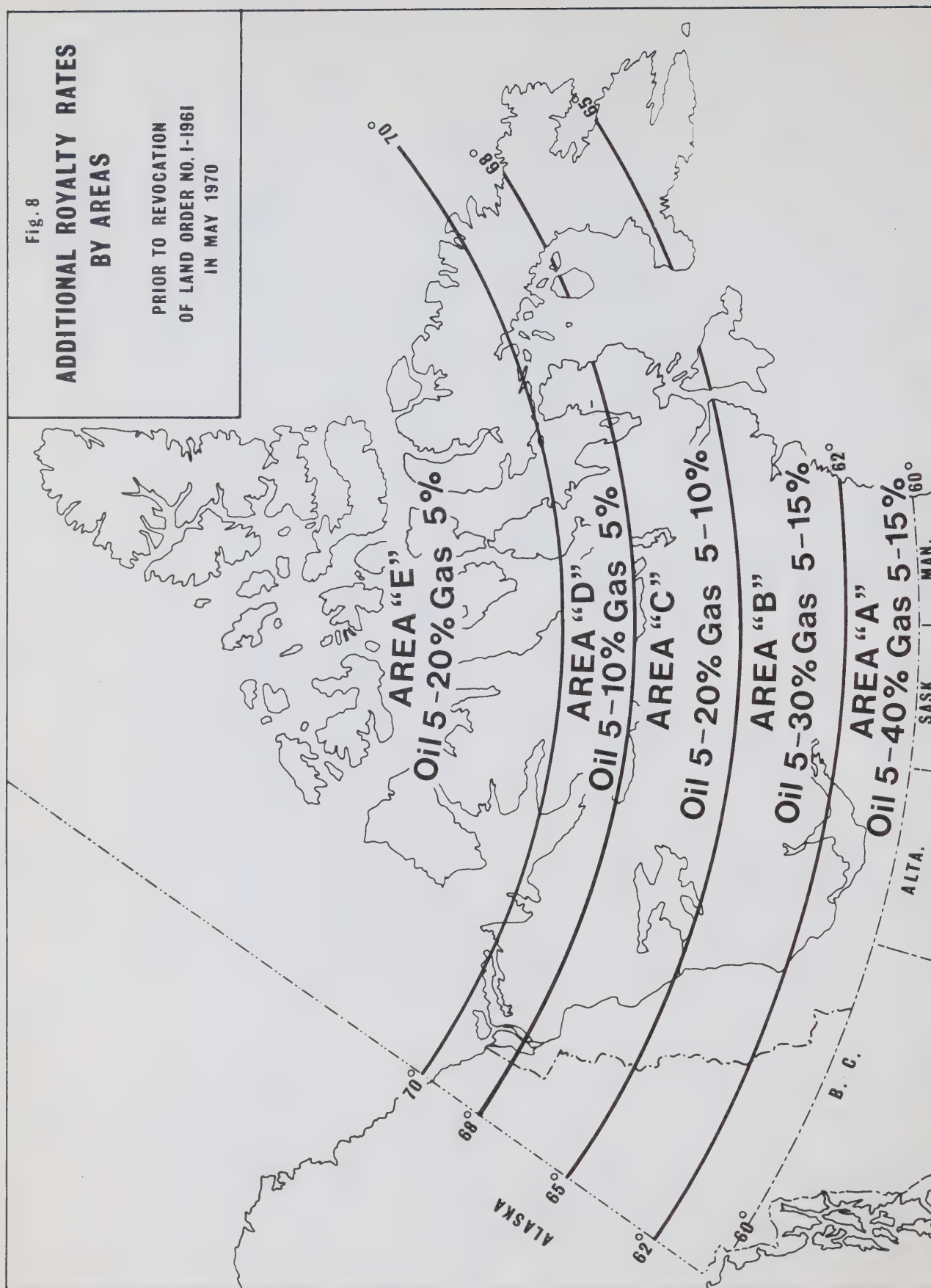
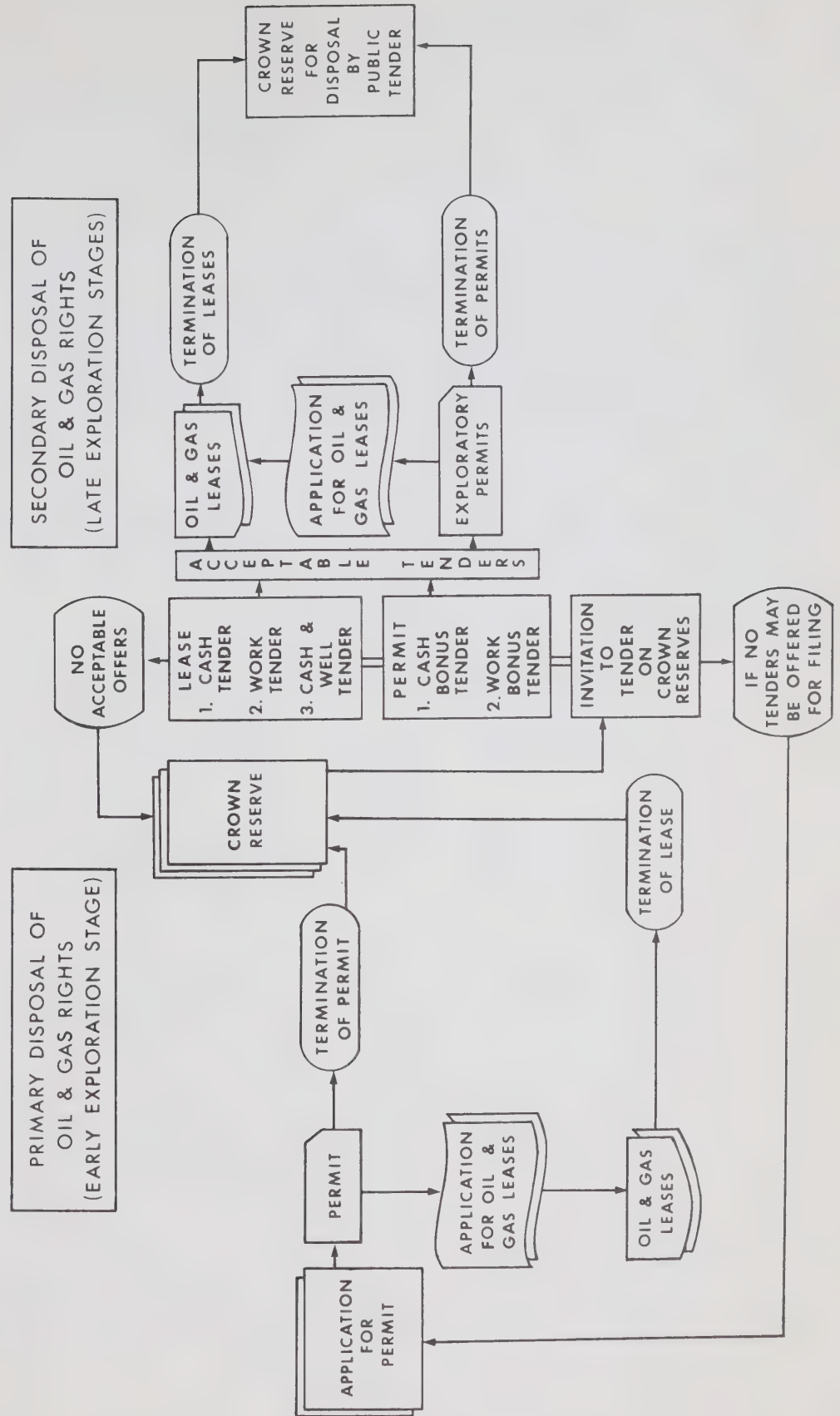




Fig. 9

# FLOW DIAGRAM OF DISPOSAL OF OIL AND GAS RIGHTS



# Revenues

While no sales of oil and gas rights were held in 1975, revenues from northern operations during the calendar year approximated \$7.7 million (Table 4 and Figure 10). Revenues from all sources for the fiscal year are shown in Table 5 and Figure 11. Figure 12 shows the annual value of work bonus for oil and gas work bonus blocks and permits. Cumulative value of work bonus to the end of 1969 was approximately \$59 million. No sales have been held since then.

Both the calendar year and the fiscal year show some increase in revenues. In mid-1974 the requirements on "Special Renewal" permits were changed to allow the permittees the opportunity of meeting the renewal requirements with new, exploratory-allowable expenditures. This incentive provision reduced revenues by some \$1 million.

**Table 4 — Gross Revenue, Oil and Gas (Calendar Year)**  
**Northwest Territories**

Year	Licence Fee	Permit Fee	Transfer Fee	Lease Fee	Rentals	Royalties	Forfeiture	Cash Bonus	Misc.	Total
1970	\$ 5,175.00	\$ 141,250.00	\$ 56,350.00	\$ 1,960.00	\$ 3,315,524.09	\$ 255,259.00	\$ 661,828.60	—	\$ 2,285.69	\$ 4,439,632.38
1971	4,900.00	395,500.00	55,806.52	1,130.00	4,070,722.82(1)	301,562.00	478,609.95	—	1,681.03	5,309,912.32
1972	4,525.00	231,500.00	37,795.00	3,150.00	4,136,291.41(2)	259,276.21	251,701.28	—	1,077.27	4,925,316.17
1973	4,100.00	183,500.00	30,235.00	1,950.00	4,836,714.92(3)	734,962.91	359,957.30	—	4,441.03	6,155,861.16
1974	3,625.00	73,220.00	44,900.00	4,140.00	3,812,555.16(4)	1,186,071.90	47,550.09	—	2,865.00	5,174,927.15
1975	2,750.00	4,000.00	10,005.00	3,970.00	3,684,559.54(5)	3,478,590.84(7)	172,517.93	—	1,353.53	7,357,746.84
Total	\$25,075.00	\$1,028,970.00	\$235,091.52	\$16,300.00	\$23,856,367.94	\$6,215,722.86	\$1,972,165.15	—	\$13,703.55	\$33,363,396.02

(1) Permit Rental — Special Renewals (\$1,528,189.50)  
(2) Permit Rental — Special Renewals (\$1,002,534.75)  
(3) Permit Rental — Special Renewals (\$1,444,172.50)  
(4) Permit Rental — Special Renewals (\$ 34,574.00)  
(5) Permit Rental — Special Renewals (\$ 4,617.50)  
(7) Bonus Royalties from Sept. 1972 to Jan. 1976 (\$498,456.45)

**Yukon Territory**

1970	—	\$ 1,750.00	—	\$ 140.00	\$ 182,448.00	—	\$29,349.60	—	—	\$ 213,687.60
1971	—	4,750.00	\$ 360.00	275.00	423,944.50(6)	\$ 4,256.88	41,506.56	—	—	475,092.94
1972	—	750.00	75.00	2,950.00	507,079.00	23,474.97	—	—	—	534,328.97
1973	—	3,500.00	—	—	417,142.38	19,075.80	—	—	—	439,718.18
1974	—	—	75.00	180.00	409,060.00	24,364.11	—	—	—	433,679.11
1975	—	—	3,610.00	90.00	204,281.25	177,504.68	—	—	—	385,485.93
Total	—	\$10,750.00	\$4,120.00	\$3,635.00	\$2,143,955.13	\$248,676.44	\$70,856.16	—	—	\$2,481,992.73

(6) Permit Rental — Special Renewals (\$24,960.00)

**GRAND TOTAL REVENUES**

1970	\$ 4,653,319.98
1971	5,785,005.26
1972	5,459,645.14
1973	6,595,579.34
1974	5,608,606.26
1975	7,743,232.77
TOTAL	35,845,388.75



Table 5 — Gross Revenue, Oil and Gas (Fiscal Year)  
Northwest Territories

Fiscal Year	Licence Fee	Permit Fee	Transfer Fee	Lease Fee	Rentals	Royalties	Forfeiture	Cash Bonus	Misc.	Total
1969-70	\$ 3,800.00	\$ 391,692.70	\$ 59,080.00	\$ 2,240.00	\$ 2,093,730.05	\$ 19,630.00	\$ 19,852.44	—	\$ 2,296.10	\$ 2,592,321.29
1970-71	5,800.00	101,508.60	60,921.52	1,450.00	3,396,332.82	255,259.00	729,500.39	—	1,930.17	4,552,702.50
1971-72	5,550.00	400,000.00	52,105.00	1,110.00	4,182,655.72(1)	301,562.00	476,328.66	—	1,848.71	5,421,160.09
1972-73	2,550.00	234,500.00	41,965.00	3,200.00	4,493,538.70(2)	303,427.08	384,624.03	—	553.27	5,464,358.08
1973-74	4,100.00	189,500.00	19,440.00	2,170.00	4,808,931.18(3)	729,372.07	188,606.71	—	5,022.14	5,947,142.10
1974-75	3,125.00	31,220.00	41,680.00	4,810.00	3,899,447.35(4)	1,283,911.85	147,713.98	—	2,290.53	5,414,198.17
1975-76	1,320.00	—	8,955.00	4,040.00	3,718,493.34(5)	4,352,171.61(7)	165,716.01	—	1,438.75	8,252,134.71
Total	\$26,245.00	\$1,348,421.30	\$284,146.52	\$19,020.00	\$26,593,129.16	\$7,245,333.61	\$2,112,342.22	—	\$15,379.67	\$37,644,017.48

(1) Permit Renewals (Rental) — Special (\$1,607,455.50)  
(2) Permit Renewals (Rental) — Special (\$1,163,492.75)  
(3) Permit Renewals (Rental) — Special (\$1,283,214.50)  
(4) Permit Renewals (Rental) — Special (\$ 34,574.00)  
(5) Permit Renewals (Rental) — Special (\$ 4,617.50)  
(7) Bonus Royalties from Sept. 1972 to Jan. 1976 (\$498,456.45)

Yukon Territory										
1969-70	—	\$10,250.00	—	—	\$ 30,749.50	—	—	—	—	\$ 40,999.50
1970-71	—	4,750.00	\$ 25.00	\$ 190.00	364,604.75	—	\$41,306.56	—	—	410,876.31
1971-72	—	—	410.00	85.00	120,688.25(6)	\$ 9,617.37	—	—	—	130,800.62
1972-73	—	750.00	—	2,950.00	453,756.50	24,865.72	—	—	—	487,322.22
1973-74	—	3,500.00	—	—	357,644.38	14,073.52	—	—	—	375,217.90
1974-75	—	—	75.00	180.00	400,627.00	55,064.20	—	—	—	455,946.20
1975-76	—	—	3,635.00	90.00	184,243.25	195,397.97	—	—	—	383,366.20
(6) Permit Renewals (Rental) — Special (\$24,960.00)	—	\$19,250.00	\$4,145.00	\$3,495.00	\$1,917,313.63	\$299,018.78	\$41,306.56	—	—	\$2,284,528.97

GRAND TOTAL REVENUES

1969-70	\$ 2,633,320.79
1970-71	4,963,578.81
1971-72	5,551,960.71
1972-73	5,951,680.30
1973-74	6,322,360.00
1974-75	5,870,144.91
1975-76	8,635,500.93
TOTAL	\$39,928,546.45

Fig. 10  
YUKON TERRITORY - NORTHWEST TERRITORIES  
CALENDAR YEAR  
**GROSS REVENUE - OIL & GAS**  
**FROM**  
**CASH BONUS BIDS, FEES, FORFEITURES,**  
**ROYALTIES, RENTALS & SALE OF MAPS**

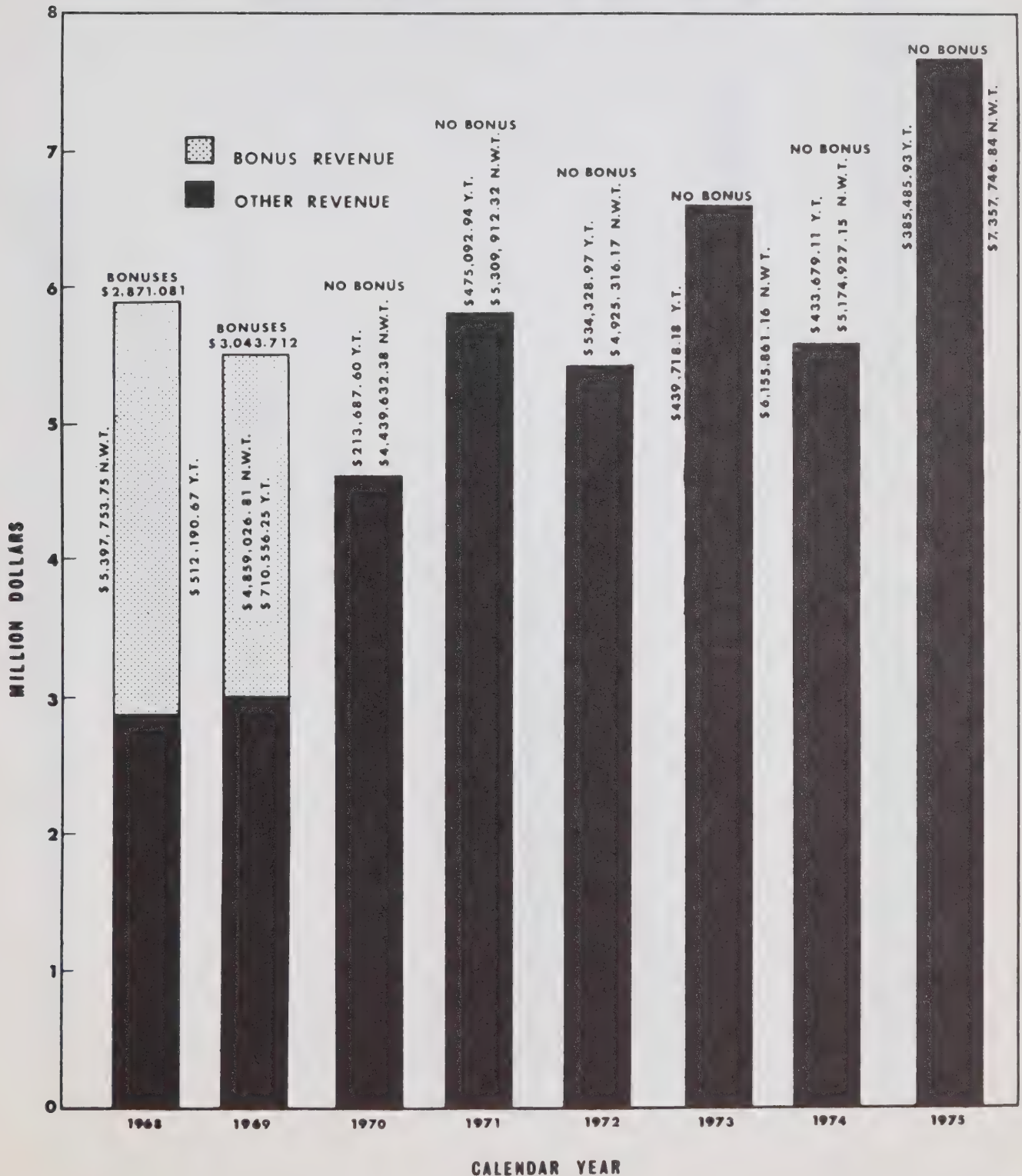


Fig. 11

**YUKON TERRITORY-NORTHWEST TERRITORIES  
FISCAL YEAR  
GROSS REVENUE-OIL & GAS  
FROM  
CASH BONUS BIDS, FEES, FORFEITURES,  
ROYALTIES, RENTALS & SALE OF MAPS**

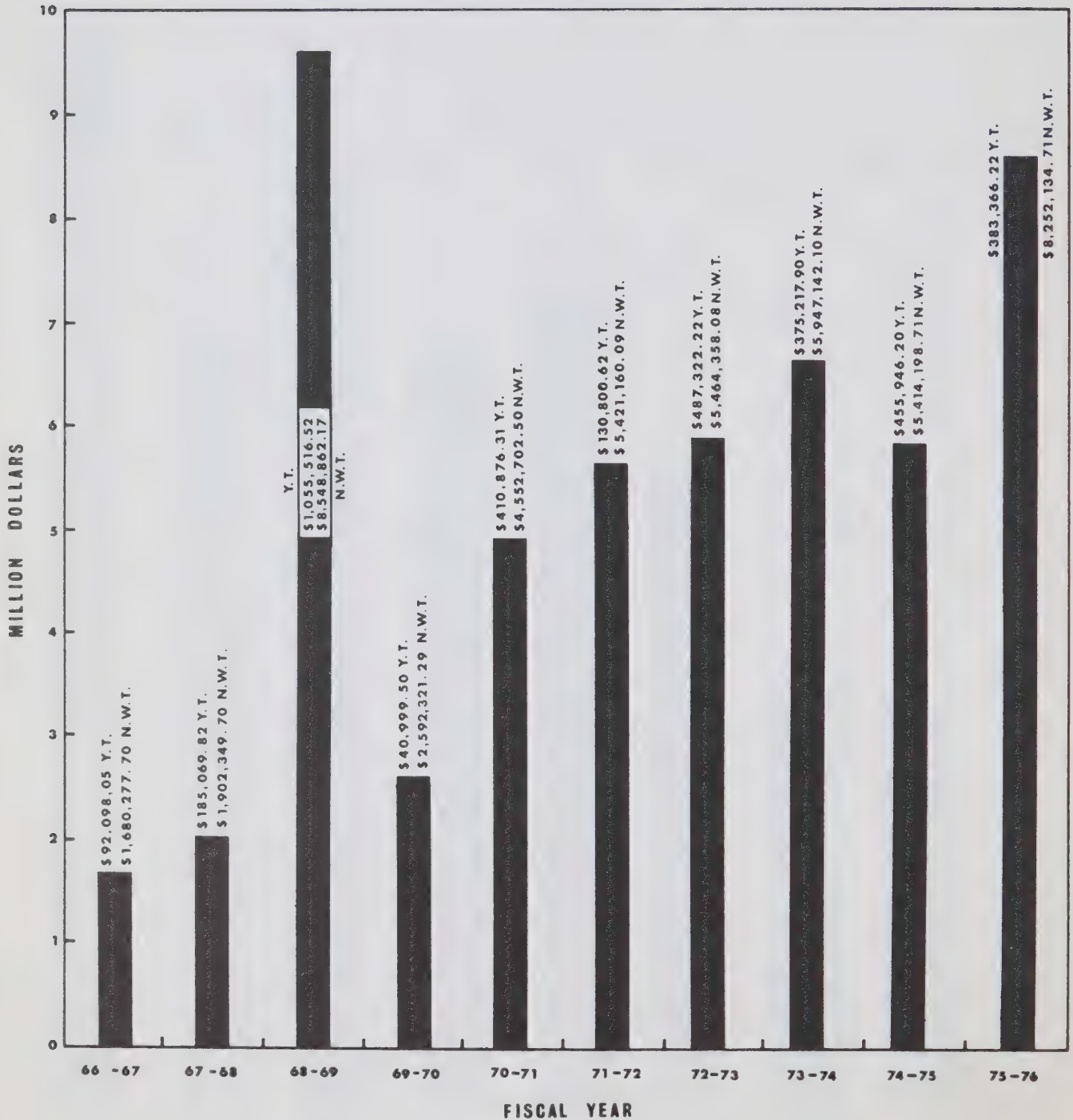




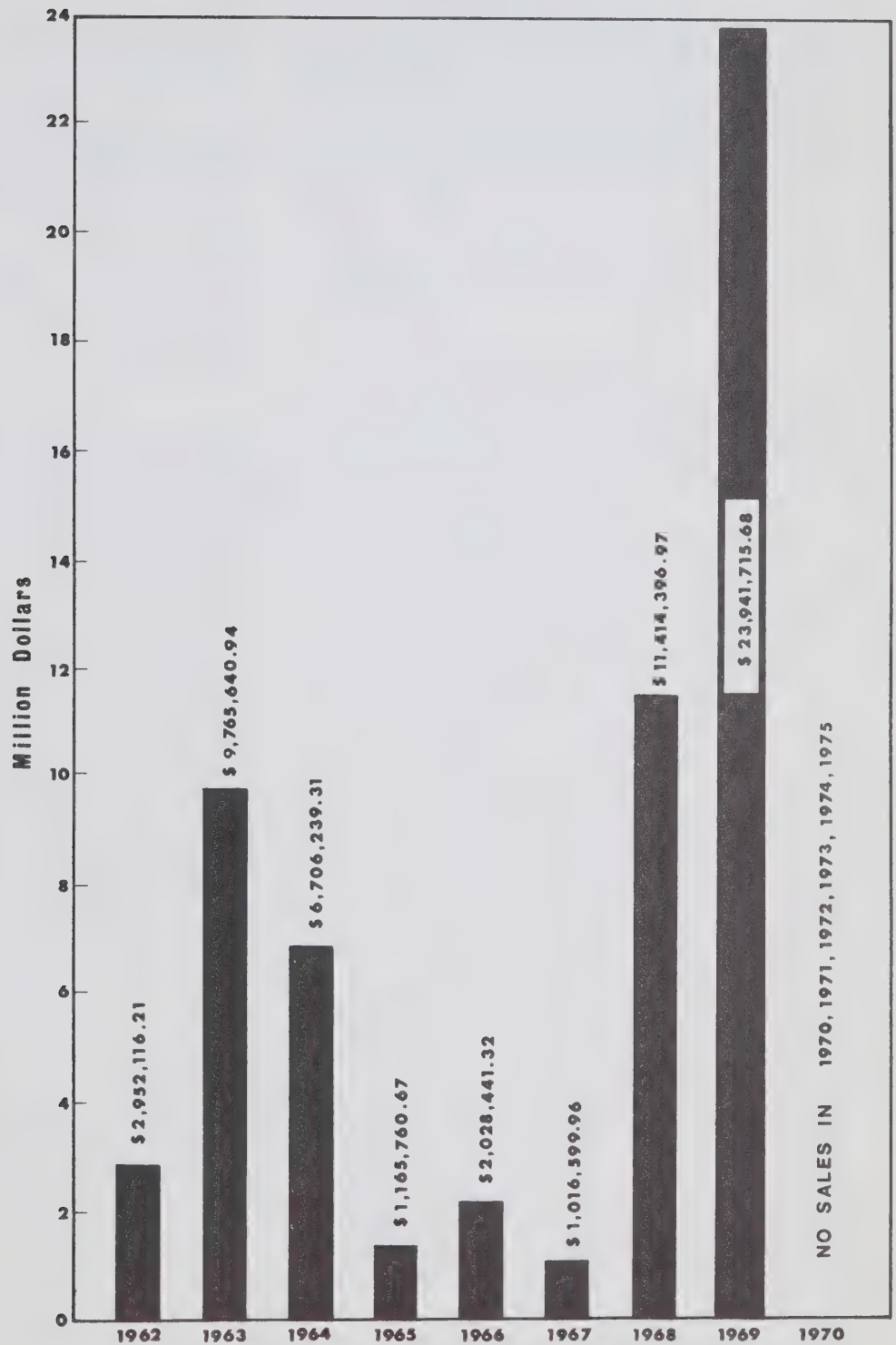
Fig.12

## VALUE OF WORK BONUS TENDERS-OIL & GAS

YUKON TERRITORY AND NORTHWEST TERRITORIES

NOTE: Cumulative Value End of Dec.1969

\$ 58,990,911.06



# Drilling Activities

## Land Drilling Activities

Figures 13 and 14, showing the number and total depth of wells drilled North of 60 in the last ten years, indicate that the number drilled decreased from 60 in 1974 to 42 in 1975 and that the total depth decreased by 28%.

Drilling operations were concentrated in three areas: Mackenzie Delta/Tuktoyaktuk area, Mackenzie Bay, and the Arctic Islands — specifically in the Sverdrup Basin.

Approximately 75% of the footage drilled in 1975 was exploratory, with five wells reporting discoveries of oil and gas. Nine development wells were drilled in 1975 and, of these, three were suspended (one oil and two gas wells), all in the Arctic Islands.

Drilling operations and production facilities North of 60 were regularly inspected by Oil and Gas Conservation Engineers and Technicians, of the Oil and Minerals Division, to ensure that safe operating practices were being followed, that the objectives of conservation of oil and gas resources were being met, and that contingency plans for the protection of the environment from blowouts and oil spills were adequate.

Wells completed or abandoned in 1975 are listed in Table 6 and also shown in the Appendix Maps, Figures 18 to 21 inclusive.

## Offshore Drilling Activities

### Arctic Islands

Drilling from man-made ice islands was continued by Panarctic Oils Ltd., the second ice-island well, East Drake I-55, being drilled in March-April. The success of this type of operation in 1974 and 1975 led to applications to drill three more wells in 1976. Drilling authority has now been granted for one wildcat and two delineation wells.

### Beaufort Sea

Imperial Oil Limited continued its program of island building. Four new islands were created, raising the company's total to nine. Applications have been submitted for the construction of three additional islands during the summer of 1976.

Sun Company completed construction of one man-made island, bringing its island total to three. No

further island construction is planned by Sun before 1977.

Five wells were spudded on the Imperial Oil islands. Two Sun Company wells, spudded in 1974, were completed, and a third was spudded in 1975.

The ship-mounted suction dredge, *Mackenzie Beaver*, made the voyage from Britain to Tuktoyaktuk via the Panama Canal under her own steam. She will be used primarily in offshore waters 40 to 50 feet deep, constructing natural-beach islands for Imperial Oil Limited.

The large-bottom, 36-inch dredge is mounted on a ship's hull whose dimensions are: length 275 feet, beam 65 feet, draft 23 feet, fully fuelled. The rated capacity of the dredge, with its 100-foot discharge, is 50,000 cubic yards per day, *i.e.* close to 50,000 tons of material per day.

Although its suction ladder can reach to 120 feet, it is doubtful that the dredge will be used for island building in waters significantly deeper than is currently normal for the Northern Construction clamshell fleet. This depends, of course on the presence of good sand bars near the planned well sites. The company has 1,500 feet of floating pipeline with which to pump sand that distance if necessary. The present intention is to locate deposits of good, coarse sand that can be pumped directly onto a site, gradually filling it in at the angle of repose; it is expected the suction dredge will be able to complete this operation faster than can the clamshell dredge.

---

Plans to carry out drilling operations from ice-reinforced, floating drillships have progressed well. Canadian Marine Drilling (CanMar), a subsidiary of Dome Petroleum, is responsible for the drill system which represents an investment of some \$120 million. Construction of two drillships and the necessary support craft is underway in preparation for the 1976 summer work. In 1975, the first ice-breaking supply boat of the operation proceeded to the Beaufort Sea and demonstrated substantial ice-breaking capabilities in the heavy ice conditions off the north coast of Alaska. The vessel wintered-over at Herschel Island.

In spring 1976, the two drillships will proceed to the sites selected for initial exploratory drilling. One will be anchored in about 190 feet of water some 70 miles north of the Imperial Adgo oil and gas discovery which, in 1974, was drilled from an man-made island built in the very shallow waters off the Mackenzie Delta. Such islands, of course, are not feasible in the deeper waters of the Beaufort Sea. The second drillship will be positioned in about 95 feet of water some 50 miles north of the Imperial Mayogiak oil discovery on Tuktoyaktuk Peninsula.

Drilling costs are estimated at \$30 million per well, making these the most costly exploration wells every drilled. Expenses of these ventures will be borne by Dome Petroleum and Gulf Oil Canada.

In the course of these operations, structures, outlined by seismograph surveys, that might contain oil and

gas reserves large enough to justify costly production and transportation systems, will be tested over a five-year program.

---

CanMar also carried out a summer program using barge-mounted equipment. Seabed samples were taken at proposed drilling locations and cores were utilized to ascertain the depth to permafrost and the composition of the upper sedimentary layers in which first casings would be cemented. Experimental procedures were tested for the setting of seabed caissons or "silos" to protect subsea blowout-preventers (BOP) from possible ice scouring. Information gained from this program should significantly aid the drilling operations planned for 1976.

Panarctic Tenneco et al W. Hecla N-52 gas well, drilled from an ice-island (courtesy Panarctic Oils Ltd.)





Fig. 13

**WELLS DRILLED**  
YUKON TERRITORY - NORTHWEST TERRITORIES  
Number of Wells Drilled to end 1975(835)

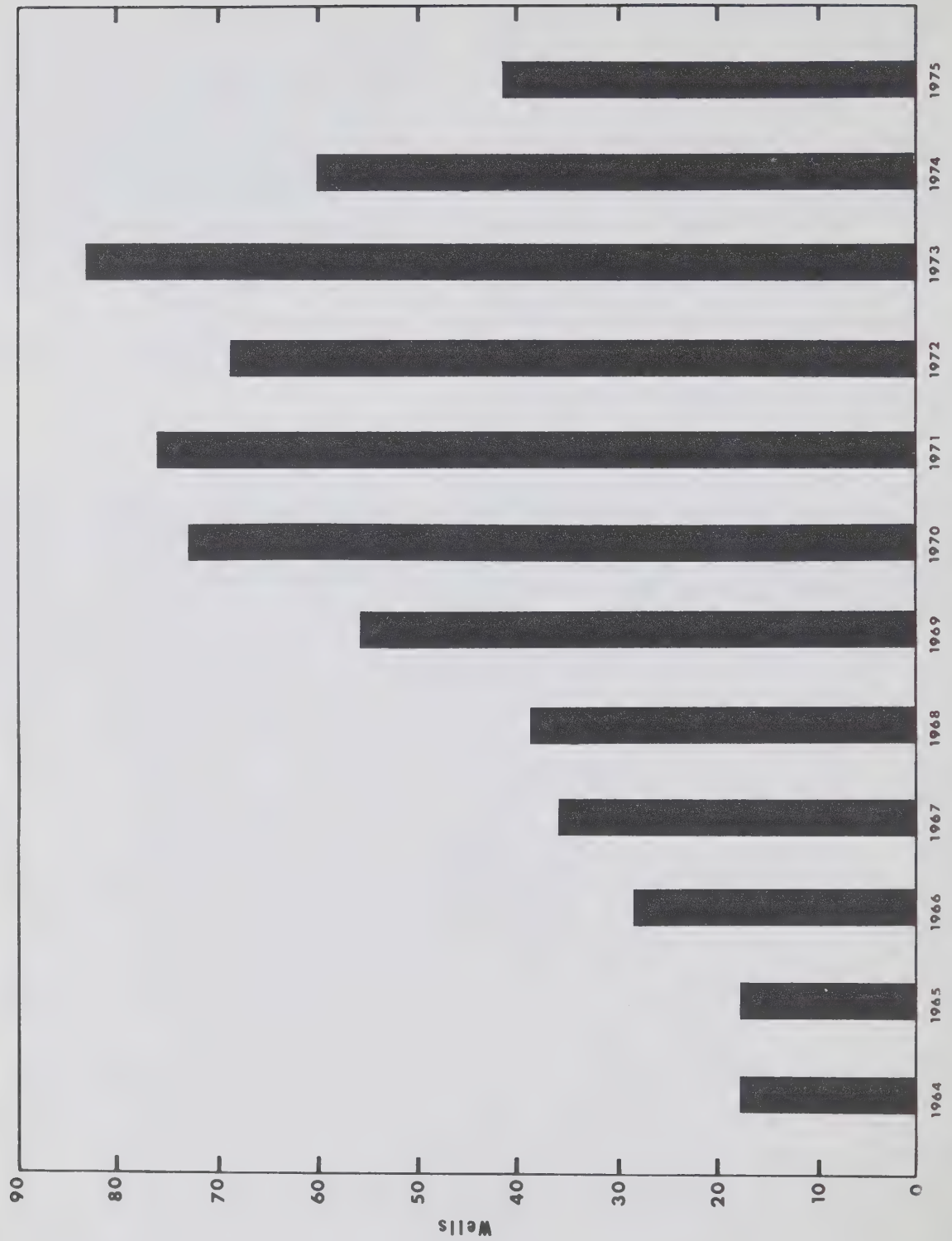
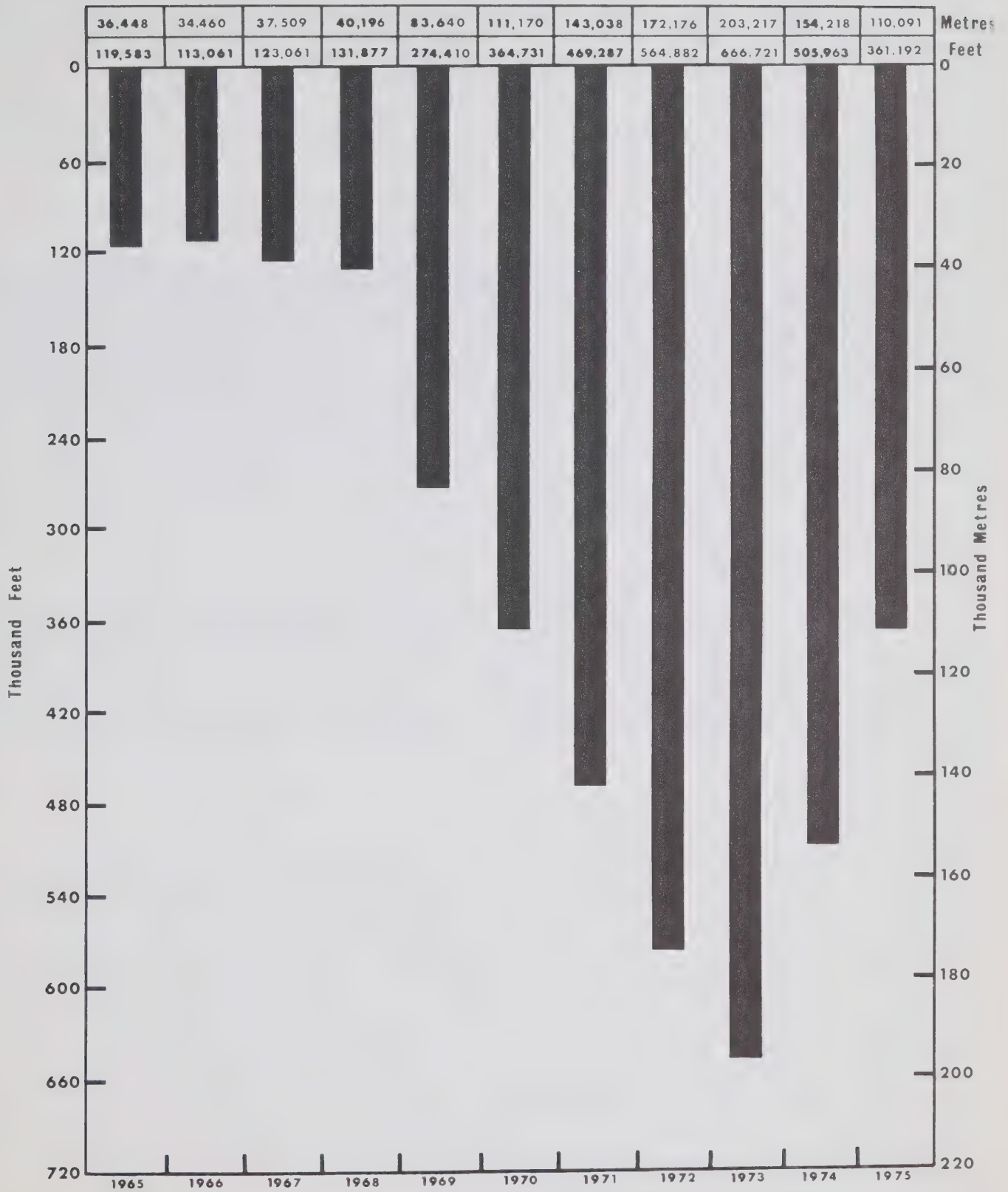


Fig.14

# DEPTH DRILLED

YUKON TERRITORY AND NORTHWEST TERRITORIES



**Table 6 — Wells Abandoned or Completed in 1975**

A total of 42 wells drilled and completed or abandoned is recorded for 1975. The total footage was 361,192 feet. (D & A indicates “dry and abandoned”)

Name of Well	Spudded	Completed	Status	Total Depth (in feet)	Name of Well	Spudded	Completed	Status	Total Depth (in feet)
<b>Northwest Territories — Arctic Islands</b>					Chevron SOBC Upluk M-38 M-38-69-30-135-15	06-02-75	04-03-75	D & A	12,350
Elfex et al Kusurhaak D-16 D-16-73-30-120-00	07-12-74	04-04-75	D & A	12,500	Dome Imp Imnak J-29 J-29-69-10-133-00	22-12-74	12-03-75	D & A	11,170
Elfex et al Wilkie Point J-51 J-51-76-40-117-00	17-03-75	21-05-75	D & A	7,700	Gulf Mobil Kamik D-58 D-58-69-00-133-15	26-11-74	14-03-75	D & A	10,468
KMG Decalta Young Bay F-62 F-62-72-50-96-30	27-05-75	11-07-75	D & A	5,343	Gulf Mobil Kamik L-60 L-60-69-00-133-15	29-03-75	04-06-75	D & A	10,522
Murphy et al Victoria Island F-36 F-36-72-50-117-00	27-01-75	15-04-75	D & A	8,062	Gulf Mobil Kikoralok N-46 N-46-69-10-134-45	20-12-74	25-01-75	D & A	6,185
Panarctic Bent Horn F-72A F-72-76-30-103-30	25-05-75	19-12-75	Completed Oil Well	10,716	Gulf Mobil Kilagmiotak M-16 M-16-69-30-134-00	24-02-75	01-04-75	D & A	10,350
Panarctic et al W. Bent Horn C-44 C-44-76-30-104-00	09-01-75	12-04-75	D & A	11,686	Gulf Mobil Ogeoqeoq J-06 J-06-68-50-133-45	23-02-75	13-03-75	D & A	6,034
Panarctic et al Castel Bay C-68 C-68-74-10-120-30	29-01-75	05-04-75	D & A	9,530	Gulf Mobil Parsons A-44 A-44-69-00-133-30	09-04-75	29-07-75	Abandoned Gas Well	11,600
Panarctic Collingwood K-33 K-33-76-40-108-30	12-08-74	12-02-75	D & A	6,713	Gulf Mobil Dome Red Fox P-21 P-21-69-20-133-30	23-02-75	03-06-75	D & A	13,710
Panarctic East Drake I-55 I-55-76-30-107-30	06-03-75	16-04-75	Abandoned Gas Well	3,900	Gulf Mobil Ya Ya I-17 I-17-69-20-134-30	22-11-74	11-01-75	D & A	8,800
Panarctic Tenn et al Drake D-73 D-73-76-30-108-00	23-04-75	10-05-75	Completed Gas Well	4,465	Gulf Mobil Ya Ya M-33 M-33-69-20-134-30	22-11-74	13-02-75	D & A	9,150
Panarctic et al Chads Creek B-64 B-64-76-30-109-30	06-12-74	27-06-75	D & A	16,523	Imp Adgo C-15 C-15-69-30-135-45	21-04-75	25-07-75	D & A	10,476
Panarctic et al E. Hecla C-32 C-32-76-30-110-00	07-11-75	10-12-75	Completed Gas Well	4,400	Imp Adgo P-25 P-25-69-30-135-45	02-01-75	28-03-75	Abandoned Gas Well	8,327
Panarctic et al Pat Bay A-72 A-72-77-30-105-00	28-02-75	06-05-75	Temp. Obs. Well	10,600	Imp CIGOL Kapik J-39 J-39-70-00-130-00	01-01-75	29-01-75	D & A	4,812
Panarctic Mocklin Point D-23 D-23-78-30-104-30	05-06-75	21-07-75	D & A	9,193	Imp Dome Louth K-45 K-45-70-00-131-15	19-02-75	12-03-75	D & A	7,274
<b>Northwest Territories — Mainland</b>					Imp Netserk B-44 B-44-69-40-135-45	06-01-75	08-06-75	D & A	11,576
BP et al Grey Goose N-70 N-70-65-20-123-30	27-12-74	08-01-75	D & A	2,250	Shell Kugpiik L-24 L-24-69-00-135-15	03-02-75	11-04-75	D & A	9,242
BP et al Losh Lake G-22 G-22-66-00-123-15	15-03-75	12-04-75	D & A	4,020	Shell Kumak K-16 K-16-69-20-135-00	23-02-75	13-07-75	Abandoned Oil and Gas Well	12,170
BP et al Russel M-07 M-07-65-30-123-30	26-01-75	05-02-75	D & A	1,739	Shell Niglintgak M-19 M-16-69-20-135-15	01-06-74	20-01-75	Completed Oil and Gas	13,206
BP et al White M-04 M-04-65-40-123-45	15-02-75	23-02-75	D & A	1,584	Shell Gulf Imp Titalik O-15 O-15-69-10-135-00	27-04-75	16-08-75	D & A	11,100
					Sun BVX et al Unark L-24 L-24-69-40-134-30	26-09-74	24-05-75	D & A	12,510



**Table 6 — Concluded**

Name of Well	Spudded	Completed	Status	Total Depth (in feet)
Sun BVX et al Pelly B-35 B-35-69-40-135-15	05-11-74	14-02-75	D & A	10,919
Union Decalta Good Hope A-40 A-40-66-30-124-30	15-12-74	28-01-75	D & A	5,225
Union Imp Stopover L-34 L-34-67-40-123-30 <b>Yukon Territory</b>	15-02-75	24-03-75	D & A	3,092

Nil

Shell Kugpik 0-13 oil discovery well in the Mackenzie Delta (*courtesy Shell Canada Limited*)



# Operations

Surface geological and photogeological surveys made by the Industry in the Northwest Territories and Yukon Territory decreased by about 82% in 1975 and seismic crew months decreased by approximately 48% — 57 crew months as against 110 in 1974 (Table 7 and Figure 15). A total of 6,886 land seismic line miles were recorded in 1975 compared to 8,785 land seismic line miles the previous year and 14,999 marine seismic line miles, compared to 10,965 marine seismic line miles in 1974 (Table 7 and Figure 16). As seismic crew months are an excellent barometer of the probable magnitude of the drilling activity for the following year, the 1975 decrease would seem to indicate a further reduction in drilling activities in 1976.

Seismic activity in 1975 was generally restricted to the Mackenzie Delta and the Arctic Islands. Detailed seismic work was carried out by, among others, Imperial Oil Limited, Gulf Oil Canada Limited, Shell Oil Canada Limited, in the Mackenzie Delta/Beaufort Sea areas. There were no land-participation surveys in 1975. In the Arctic Islands major seismic programs were continued by Panarctic Oils Ltd. on Prince Patrick and Melville islands and by the Sun Company on ice in the inter-island areas, using conventional land seismic techniques. The two companies utilized nine seismic crews during the period November to May.

Marine seismic operations were carried out in the Lancaster Sound area by Norlands and in the inter-island areas by the Arctic Island Offshore Group operated by Sun Company.

Seismic surveys in the Davis Strait and Baffin Bay areas were carried out by Imperial Oil Limited, Canada-Cities Service, Ltd., Shell Oil Canada Limited and Gulf Oil Canada Limited. Participation-type programs were operated by Eureka Exploration and Geophysical Services Incorporated.

## **New Satellite for Iceberg Survey**

By 1978, the federal government plans to have a \$20-million satellite, built by Lockheed Aircraft Corp. of Canada in polar orbit to watch for icebergs. The Lockheed contract calls for development of a satellite capable of circling the earth 14 times per day and covering 95% of the total ocean surface of the Arctic Ocean every 36 hours. The company has indicated that the satellite is also to send back information on

surface winds and temperatures, on currents, wave heights, and ice conditions generally.

## **Expansion of Airstrip at Coppermine**

Gulf Oil Canada Limited completed a major expansion of the airstrip at Coppermine, an Eskimo community about 500 miles east of Inuvik. Located just outside the town and designed to handle most of the cargo and passenger planes serving Canada's far north, the new all-weather 5,000-foot runway was developed in collaboration with the federal Department of Transport. Gulf Canada not only supplied most of the equipment used but also contributed \$170,000 to the project.

Coppermine is a key centre of the company's successful recruiting and on-the-job training program for native people. For the past three years, approximately 50 Inuit workers from the Coppermine area have been airlifted regularly to Gulf's Swimming Point base camp in the Mackenzie Delta, 500 miles to the west.

**Table 7 — 1973-1975 Exploration Survey Statistics**

Area	Geological Crew				Land Seismic				Marine Seismic			
	Months			Change	Crew Months		Line Miles		Line Miles		Change	
	1973	1974	1975		1973	1974	1973	1974	1973	1974	1973	1974-75
Yukon Territory	3.0	3.5	0	- 3.5	10.0	3.0	611	121	0	0	0	—
N.W.T. — Mainland	9.0	1.5	0	- 1.5	25.0	27.1	1,152	1,932	1,572	0	18	—
Mackenzie Delta	0	4.5	0	- 4.5	42.0	41.1	3,473	3,229	679	0	0	—
Beaufort Sea	0	0	0	—	4.0	2.0	470	75	9	4,603	1,724	+ 844
Arctic Islands and surrounding waters	37.0	15.5	3.5	-12.0	58.0	37.1	5,551	3,428	4,626	5,006	4,159	- 818
Baffin Bay — Davis Strait	1.0	0	1.0	+ 1.0	0	0	0	0	0	11,075	5,072	+ 4,018
Total	50.0	25.0	4.5	-20.5 or -82%	139.0	110.3	11,257	8,785	6,886	20,702	10,955	+ 4,044 or + 37%
												-1,899 or -22%
												+1,198
												0
												- 121
												- 360
												-2,550
												- 66
												+1,198
												0
												- 52.95 or -48%
												-1,899 or -22%







**Fig. 2**  
**Oil and Gas Fields**  
**and Discoveries**

#### **YUKON TERRITORY**

- 1 Beaver River Gas Field
- 2 Chance Gas Field
- 3 Socony Mobil et al Blackie No. 1
- 4 Socony Mobil et al Birch Y.T. B-34

#### **NORTHWEST TERRITORIES**

- 5 Pointed Mountain Gas Field
- 6 Rabbit Lake Gas Field
- 7 C.P.O.G. et al LaBiche F-08
- 8 H.B. Cameron Hill A-05
- 9 S. Island River Gas Field
- 10 Home Signal Celibeta H-78
- 11 Shell H.B. Grumbler G-63
- 12 Sun Netla C-07
- 13 Texaco Bovie Lake J-72
- 14 Union Pan Am. Trainer Lake C-39
- 15 Pacific Amoco Tathlina N-18
- 16 Norman Wells Oil Field
- 17 Taglu Gas Field
- 18 Parsons Gas Field
- 19 Gulf Imperial Shell Titalik K-26
- 20 Gulf Imperial Shell Reindeer F-36
- 21 Gulf Mobil Ya Ya P-53 and A-28 Gas Pools
- 22 Shell Niglintgak H-30 and M-19
- 23 Imperial I.O.E. Mallik L-38
- 24 Imperial Ivik J-26
- 25 I.O.E. Mayogiak J-17
- 26 I.O.E. Atkinson H-25
- 27 Shell Kugpiq O-13
- 28 Imp. Adgo F-28
- 29 Ashland Tedji Lake F-24
- 30 Kumak Oil and Gas Field
- 31 Garry Oil and Gas Field

#### **ARCTIC ISLANDS**

- 51 Drake Point Gas Field
- 52 Hecla Gas Field
- 53 King Christian Gas Field
- 54 Panarctic Tenneco et al Kristoffer Bay B-06
- 55 Dome Arctic Ventures Wallis K-62
- 56 Thor Gas Field
- 57 Panarctic Romulus
- 58 Dome Sutherland O-23
- 59 Panarctic Bent Horn N-72



Fig. 15

## EXPLORATION ACTIVITY

YUKON TERRITORY AND NORTHWEST TERRITORIES

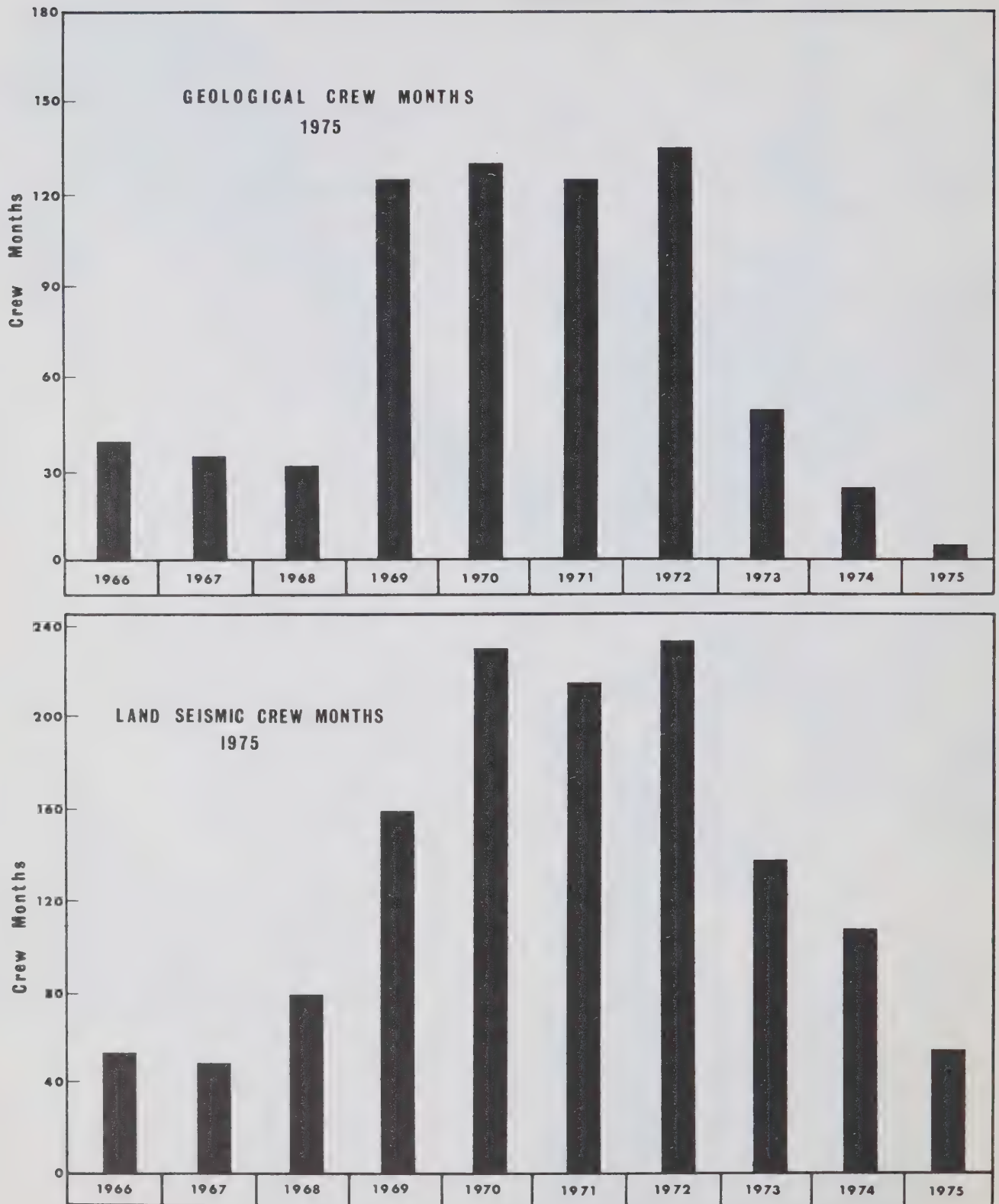
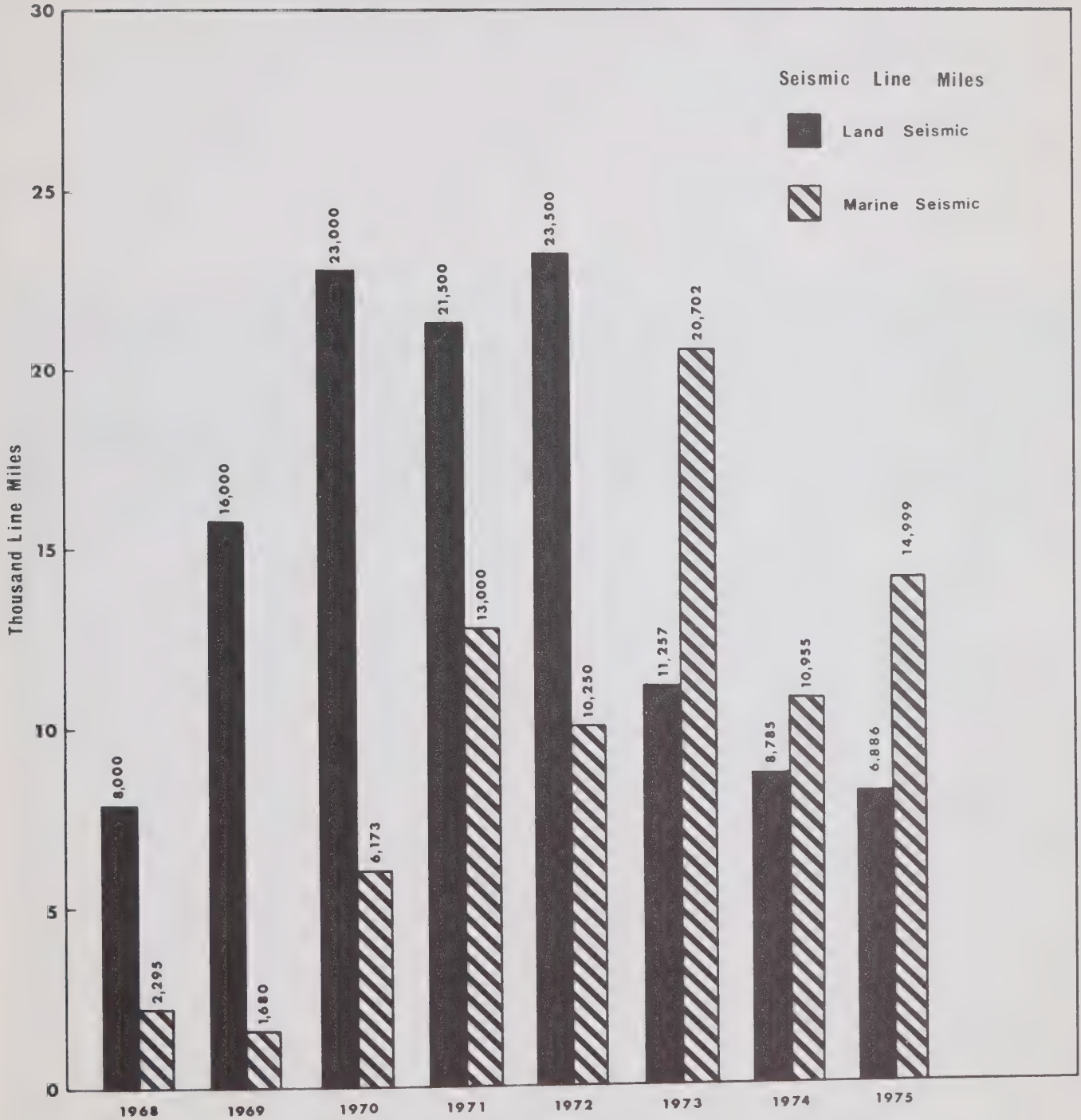




Fig. 16

## EXPLORATION ACTIVITY

YUKON TERRITORY AND NORTHWEST TERRITORIES



Tug pushing flotilla of barges in the Mackenzie River near Bar-C base camp (*courtesy Imperial Oil Limited*)





Barges of equipment being unloaded on the banks of the Mackenzie River (*courtesy Shell Canada Limited*)





# Exploration and Drilling Expenditures

Total industry expenditures, which include in-house seismic processing, overhead, land retention, royalties and taxes, exceeded \$350 million in 1975 — a \$50 million increase from 1974.

Field expenditures on oil and gas exploration North of 60 exceeded \$215 million in 1975, approximately \$35 million less than in 1974 (Figure 17). This figure indicates the amount of money available for credits for the maintenance and retention of oil and gas permits and leases in the North. Expenditures for exploratory and development drilling amounted to approximately \$150 million, down \$20 million from the previous year.

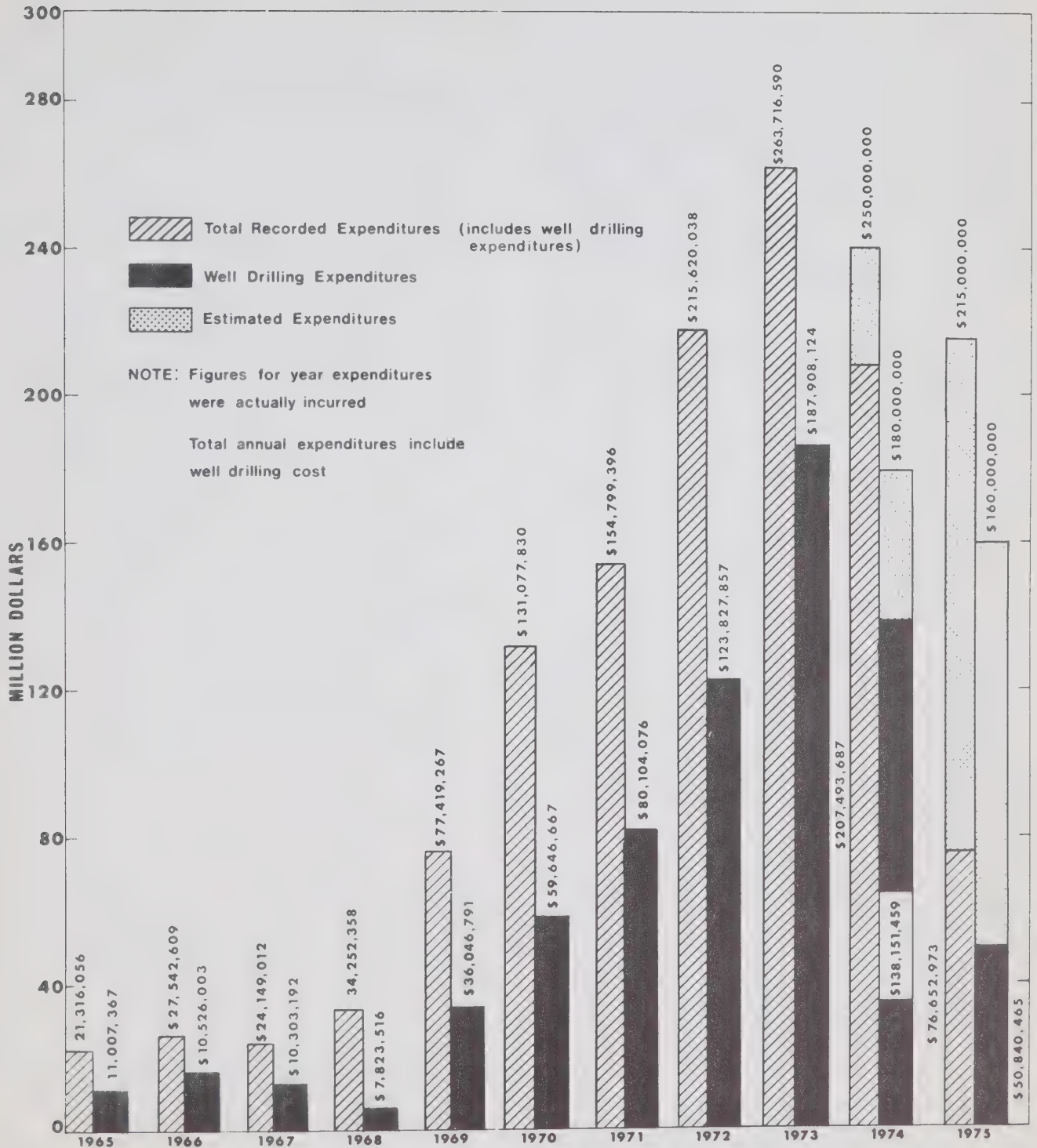
Total geophysical and geological expenditures decreased to approximately \$55 million, a drop of \$15 million from 1974.

Expenditures for exploratory drilling and seismic exploration exceeded similar expenditures in each of the individual ten provinces and in the combined Atlantic and Pacific areas.

Figure No. 17 shows that field expenditures decreased by approximately 5% from 1973 to 1974 and 14% in 1975. Early indications are that field expenditures will decrease in 1976 from their level in 1975. However, if as anticipated, additional permits and leases are issued and if offshore drilling commences in the Beaufort Sea in 1976, expenditures related to oil and gas activities are expected to increase to \$300 million. With development — drilling in the Mackenzie Delta and with the possible construction of the Mackenzie Valley pipeline, expenditures in the late 1970's may exceed \$1 billion a year.

FIG. 17

# **OIL & GAS EXPLORATION EXPENDITURES SUBMITTED FOR WORK CREDITS**



# Pipelines

## **Canadian Arctic Gas Pipeline Ltd. (CAGPL) Applications to Build Mackenzie Valley Gas Line**

Early in 1975, applications were filed in Canada and in the United States by Canadian Arctic Gas Pipeline Ltd. for the first-phase approvals required to begin work on the largest and most costly construction project ever planned by private enterprise, the Mackenzie Valley gas transmission system. Canadian Arctic Gas Pipeline Ltd. is a consortium of 16 companies.\*

The composite project would consist of 2,625 miles of main line, of which 2,430 miles will be in Canada and 195 miles in Alaska. Ultimate compression capacity installed at full capacity of 4.5 BCFD, would be 1,630,000 hp, and refrigeration units would amount to 272,000 hp, making a total of 1,902,000 hp. Related pipeline-construction by other companies taking gas from the new system would total at least 3,000 miles. The Canadian Arctic Gas venture would, therefore, initiate the largest integrated pipeline complex ever built.

The proposed system would consist of two 48-inch supply lines, one running 145 miles from the Mackenzie Delta Taglu Field, the other running 490 miles from the Prudhoe Bay oil and gas field, the two joining at a point near Travaillant Lake in the Northwest Territories. A single 48-inch line would then continue south through the Mackenzie Valley for 1300 miles to a point near Caroline in west central Alberta. There it would split into two 42-inch branches: the west branch running 280 miles southwest to Kingsgate, B.C.; the east branch running 395 miles to Monchy, Saskatchewan. A small 30-inch, 15-mile lateral will link the gas-discovery area of Parsons Lake to the main Delta branch in the Northwest Territories.

Canadian Arctic Gas has filed submissions with the National Energy Board (NEB) giving a capital cost estimate of \$7.5 billion at 1975 cost levels for the gas

transmission line from the Mackenzie Delta to central Alberta. The entire pipeline system would cost an estimated \$12 billion.

## **Foothills Pipe Lines Ltd. Proposal — a “Maple Leaf” Mackenzie Gas Line**

Foothills Pipe Lines Ltd. is a “Special Act” company, capitalized at 10 million shares issued and outstanding of which 80% are held by Alberta Gas Trunk Line Company Ltd. (AGTL) and 20% by or for Westcoast Transmission Company Ltd., the sponsoring companies. Other sponsoring companies are expected to join as participants with the proviso that they are Canadian-controlled and able to provide substantial aid in getting Beaufort/Mackenzie gas to Canadian markets as soon as possible. Under this proposal an 820-mile, 42-inch, wholly Canadian-owned and operated natural gas transmission main line would be built from the Mackenzie Delta/Beaufort Sea area, up the Mackenzie Valley (following the same route as that proposed by CAGPL) to a point south of Fort Simpson near the intersection of the 60th parallel with the common boundary of Alberta and British Columbia. From there, a major connection would branch off to connect with the transmission system of Westcoast in the Northwest Territories and northern British Columbia. The main line would continue southeastward in Alberta, using the right-of-way of AGTL to connect with the AGTL main lines system at its “McLeod Junction” west of Edmonton, and thence to link with the existing AGTL and with TransCanada PipeLines (TCPL) systems in Saskatchewan, Manitoba, Ontario and Quebec.

Foothills Pipe Lines Ltd. would be responsible for constructing and operating the section north of 60°N; Westcoast, the British Columbia section; AGTL, the section from the 60th parallel to “McLeod Junction”; and TCPL, all territory east of Alberta.

Capital expenditures, including the cost of expanding the TransCanada PipeLines Limited system east and of expanding and extending the Westcoast Transmission Co. Ltd. system, is expected to be about \$4.5 billion.

Foothills Pipe Lines Ltd. filed formal applications with DINA and NEB in the first half of 1975. It is estimated that construction of the 42-inch pipeline would require two winter seasons and that the pipe would be capable of transporting gas to southern Canadian

\*The 16 companies are: Alberta Natural Gas Company Ltd.; Tenneco Oil & Minerals Limited; the Consumers' Gas Company; Norcen Energy Resources Ltd.; Union Gas Limited; TransCanada PipeLines Limited; Gulf Oil Canada Limited; Imperial Oil Limited; Shell Canada Limited; Columbia Gas Transmission Corp.; Michigan Wisconsin Pipe Line Company; Natural Gas Pipeline Company of America; Northern Natural Gas Company; Pacific Lighting Gas Development Co.; Panhandle Eastern Pipe Line Co. and Texas Eastern Transmission Corp.



markets two and one-half years after final regulatory approvals are given. The operating pressure of the pipeline would be 1250 psi. Capacity at commencement would be 1.25 BCFD. In four years the full capacity of 2.25 BCFD would be reached.

### **Polar Gas**

The Polar Gas Group was founded in late 1972 with the aim of investigating the feasibility of a natural gas pipeline from the Arctic Islands. The group study areas include ecology, engineering, ice, bathymetry, and aerial photography. Total research costs to date of filing of applications has been estimated at \$57 million of which \$20 million had already been spent as of June 30, 1975. Subsequent to the filing of application which is expected to be in 1977, and up to the date of permanent financing following certification, costs related to pre-construction engineering activities could amount to a further \$50 million. The pipeline could be constructed in the late 1970's with the first gas deliveries reaching market in the early 1980's.

Three possible routes are being investigated:

- (a) a 48-inch pipeline extending from Drake Point, Melville Island, across Barrow Strait to Somerset Island and Boothia Peninsula through the District of Keewatin to the Manitoba border and then southeast to the markets of southern Ontario and Quebec. The capacity of the line would be 3-4 BCFD and the cost would be approximately \$7.5 billion.
- (b) a 42-inch pipeline following the same route as a) above as far as the Manitoba border, then south to Winnipeg to connect with the existing TransCanada Pipelines system. The capacity of this line would be 2 BCFD and the cost approximately \$4.5 billion.
- (c) a 48-inch pipeline extending southeast from Spence Bay across Southampton, Coates and Mansell islands to the east coast of Hudson Bay and from there to Montreal. The capacity of this line would be 3-4 BCFD and the cost approximately \$9.2 billion.

### **Ontario Energy Corporation and Petro-Can to Become Partners in Polar Gas Project**

The Polar Gas Project has been assured of funding by the Ontario Energy Corporation (OEC) and Petro-Can. According to an announcement from Toronto, OEC is engaged in the final stages of negotiations to enable it to join the five companies that are the present partners in the Polar Gas Project.

By the end of 1975 these companies will have spent some \$30 million on research and studies related to this huge project. It is estimated that expenditures totalling some \$40 to \$50 million will be required to advance the project to the application-filing stage. Funding beyond that point would be provided on a pro-rated basis. Other new partners would reduce each participant's dollar investment requirements accordingly. The five firms now in the Polar Gas

Project are TransCanada PipeLines Limited, Panarctic Oils Ltd., Texas Eastern Transmission Corporation, Tenneco Oil & Minerals Ltd. and Pacific Lighting Development Corporation. A sixth firm, Canadian Pacific Investments (CPI) withdrew its direct participation at the end of June 1975, having completed its initial objectives in the program. Of course CPI still has indirect interest through share holdings in both TransCanada Pipelines Limited and Panarctic Oils Ltd.

The Ontario Minister of Energy has announced that OEC would be joining the Polar Gas Project and that the Ontario Government was prepared to invest upwards of \$10 million in the research and application aspects of the undertaking. Thus the Polar Gas Project is now assured sufficient money for ongoing expenses. Once expenditures are equalized, all partners to the project contribute proportionally their shares.

### **Beaufort-Delta Oil Project Limited Preparation for Pipeline Application**

Beaufort-Delta Oil Project Ltd. is a Calgary-based company. It has been incorporated for the purpose of carrying out the necessary planning, design and preliminary work related to and required for application to the appropriate regulatory agencies for permission to construct and operate a feeder and trunk pipeline system to transport oil from the Beaufort Sea and Mackenzie Delta areas, should sufficient reserves be discovered to warrant such a system. This pipeline system would connect with existing oil transmission systems in southern Canada. Beaufort-Delta has access to the Mackenzie Valley Pipe Line Research data and to the experience and data of Canadian Arctic Gas Study Ltd. and Foothills Pipe Line Ltd.

The participants in Beaufort-Delta, five in all, include three exploration and producing companies actively engaged in oil and gas development of the Canadian Western Arctic — Imperial Oil Ltd., Shell Canada, and Gulf Oil Canada — and the two major Canadian oil transmission companies — Interprovincial Pipe Line Limited and Trans Mountain Pipe Line Company Limited.

Initial efforts have been directed toward the preparation of applications to DINA and NEB to have them ready for filing in early 1977. The size of the pipeline has not yet been chosen because of present uncertainties regarding the extent of possible oil reserves in the area.

Current plans call for construction to start in 1981 but not to be completed before 1984. Capital costs are expected to range between \$2 billion and \$4.4 billion, at 1975 levels.

### **First Sale of Mackenzie Delta Gas**

TransCanada PipeLines Ltd. has completed its first contract for the purchase of gas from the Mackenzie Delta with an agreement to buy four trillion cubic feet from Imperial Oil Ltd.

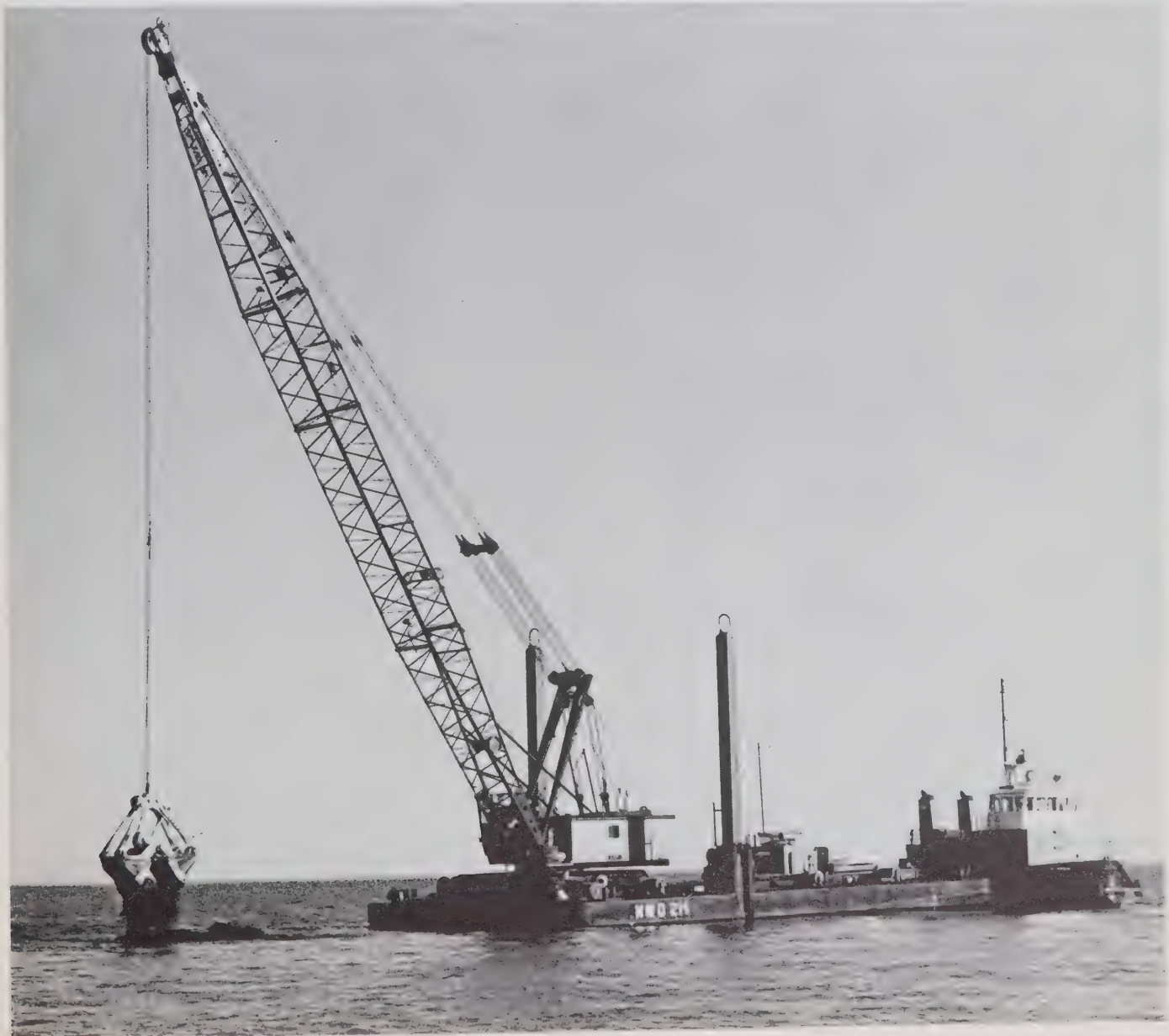
This agreement, the largest gas-purchase contract ever signed by TransCanada, involves the purchase of 500 MMCFD over a 22-year period from the date of first delivery. The daily volume is equal to one-fourth of the pipeline company's current Canadian sales.

The wellhead price is to be calculated under a net-back formula pegged to the commodity value of gas in Toronto, less delivery costs. Reportedly, the price could be 60 to 70 ¢/MCF if deliveries could have begun immediately. This figure has been estimated from a commodity price of about \$12/Bbl for crude — less delivery cost of \$1.40 to \$1.50/MCF.

TransCanada PipeLines Ltd., which says it is conducting gas-purchase talks with other Delta operators, is a member of the 16-company Canadian Arctic Gas consortium which proposes to lay a \$12 billion pipeline from the Delta and the Alaskan North Slope to supply markets in the United States and Canada.

Imperial Oils Ltd. has already made several discoveries in the Delta, including the Taglu Field which has reserves estimated by the company at more than three trillion cubic feet.

Construction of man-made island, Netserk, using clamshell cranes (courtesy Imperial Oil Limited)





# Participation and Research Projects

In addition to the programs of the Arctic Petroleum Operator's Association (APOA), approximately 15 participation and research-type projects were initiated or continued during 1975. Expenditures incurred for these projects qualify for work credits and, when approved, can be applied to permits in approved designated areas. Major programs in these categories in 1975 included:

## **Geophysical Surveys**

*Eureka Exploration Ltd.* carried out a large reconnaissance marine seismic program encompassing the sedimentary areas in the Davis Strait-Baffin Bay area.

*Overland Exploration Services (1969) Ltd.* completed a large reconnaissance gravity program in the Liard area of the Yukon and Northwest Territories.

*Photogravity Surveys Ltd.* completed a comprehensive gravity survey from Lat. 60°N along the Mackenzie Valley to the Delta and west along the Arctic Coast to the Alaska border.

Sun Company, the operator for the *Arctic Islands Offshore Group*, commenced seismic operations in the Sverdrup Basin employing four conventional land seismic crews. During the summer months this program was supplemented with the services of a marine seismic vessel. The whole program is expected to take three years and will cost in the order of \$40 million.

## **Geological Surveys**

*Robertson Research (North America) Ltd.* is carrying out a paleontological and palynological determination on samples from selected wells in the Delta and Arctic Islands.

*V. Zay Smith Associates Ltd.* completed large structural and stratigraphic mapping programs along the Mackenzie Valley to the Arctic in 1975, as well as similar work in the Arctic Islands.

## **Research Programs**

### **Arctic Petroleum Operators' Association Programs**

The Association spent over \$10.0 million in its 1975 programs. This was mainly on activities directly related to far north operations.

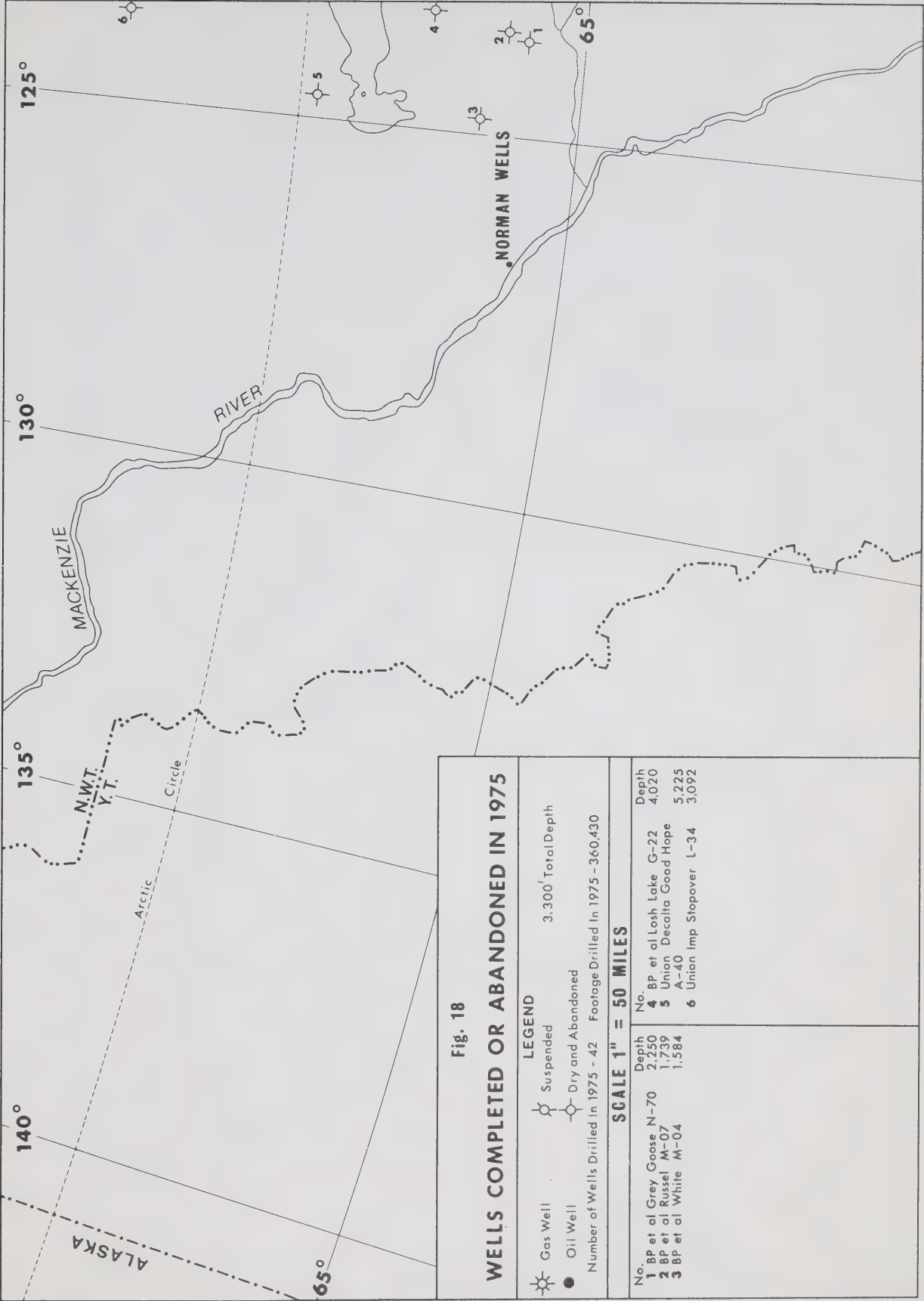
APOA continues to have representation on the Advisory Committee for the Arctic Land Use research program, and has supported projects conducted in the Mackenzie Delta area by the University of Alberta and other Canadian universities.

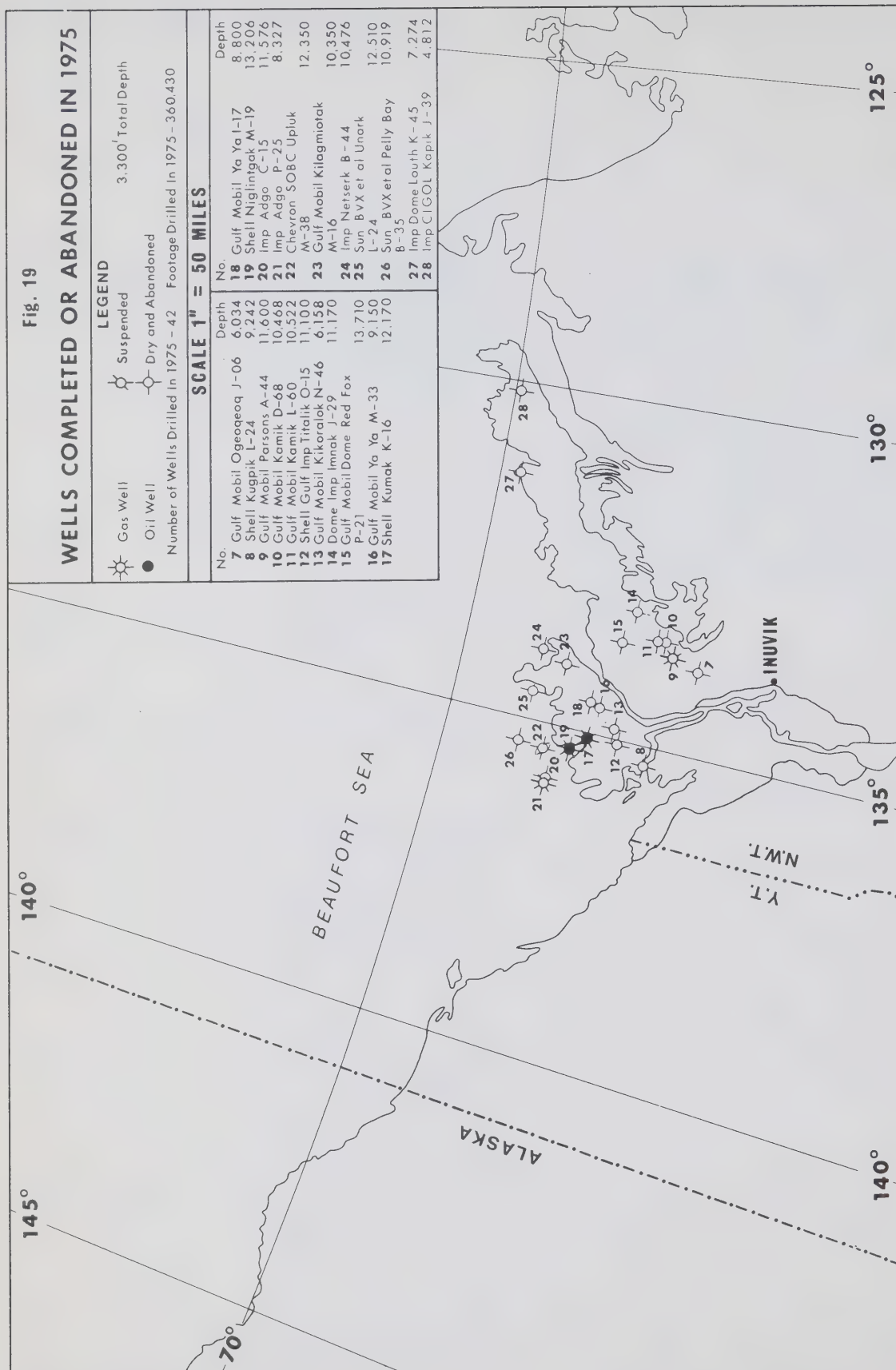
The Association undertook the preparation of an Operators' Guide Booklet for distribution to its members and to government personnel. The booklet is available to any other interested parties at a cost of \$25 a copy. In addition, as a gesture of international co-operation, the drilling sub-committee of APOA will make available copies of the booklet to their counterparts in the Canadian-Soviet commission for exchange of general technology in oil and gas field development.

In 1975, an ice, weather, sea state, and data gathering and processing program was completed. The objectives of the program was to predict ice movements and coverage, to gather information on micro-weather and on sea state, and to develop techniques to predict accurately ice position relative to rig locations in the Beaufort Sea. Total cost of this program is estimated at \$550,000.

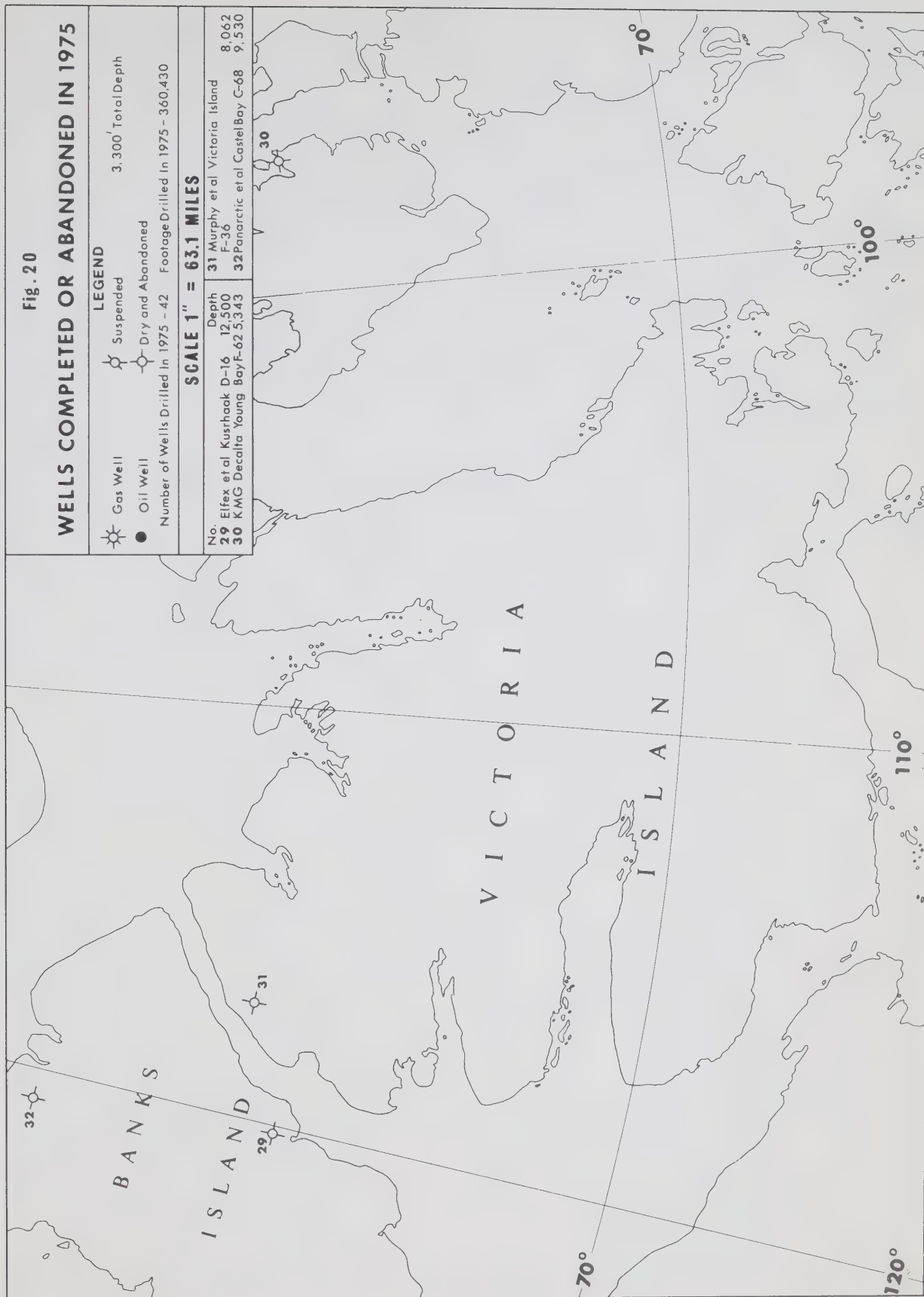
### **Two-Year Environmental Study in Preparation for Beaufort Sea Drilling**

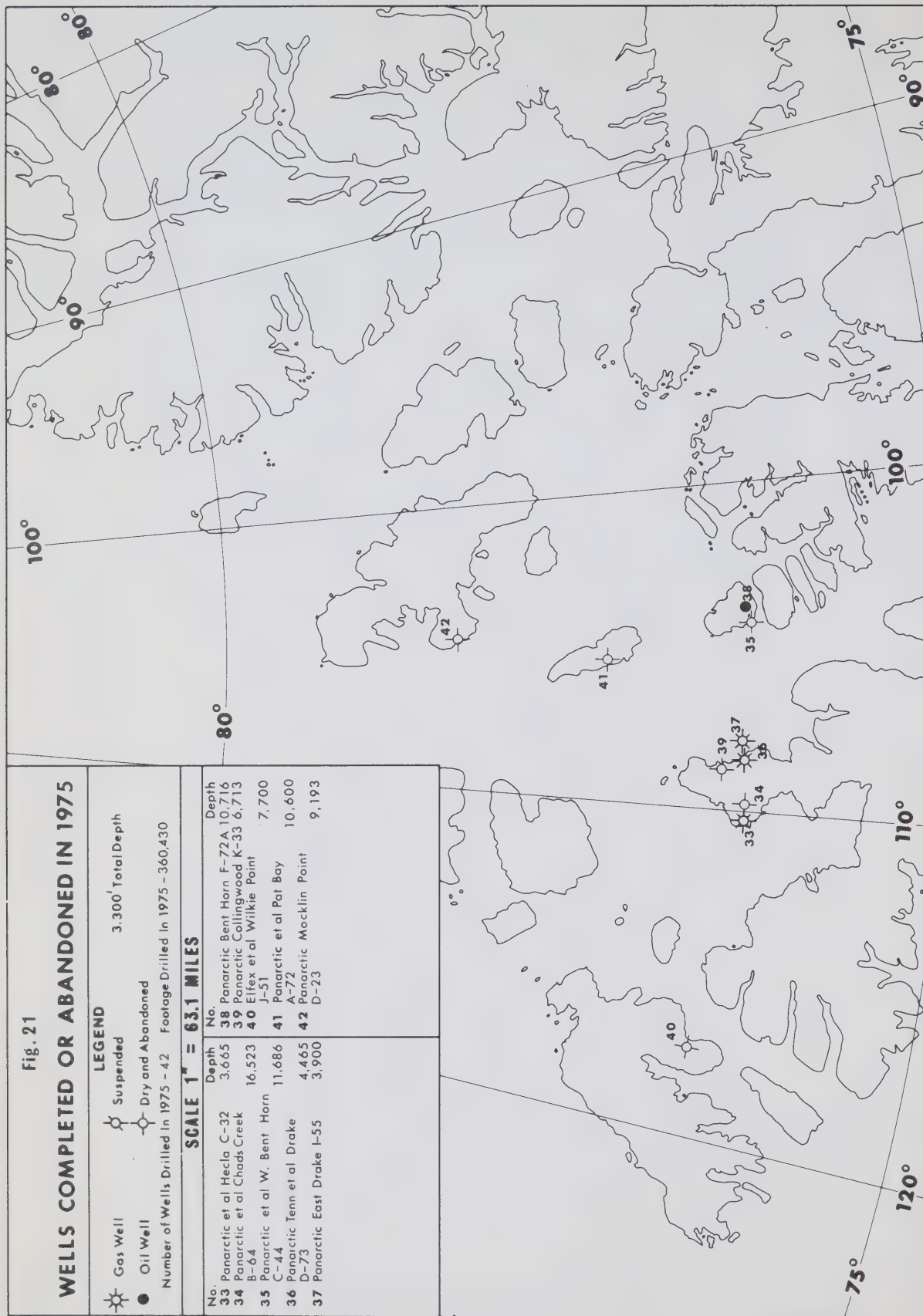
The Department of Indian and Northern Affairs indicated that offshore drilling in the Beaufort Sea will not be permitted to start before the summer of 1976, so that at least two full years of environmental studies will have been completed by industry and the government. The oil industry has tentatively agreed to fund up to \$12.5 million for the priority environmental studies that must be done during this period.
















# QUEEN ELIZABETH ISLANDS

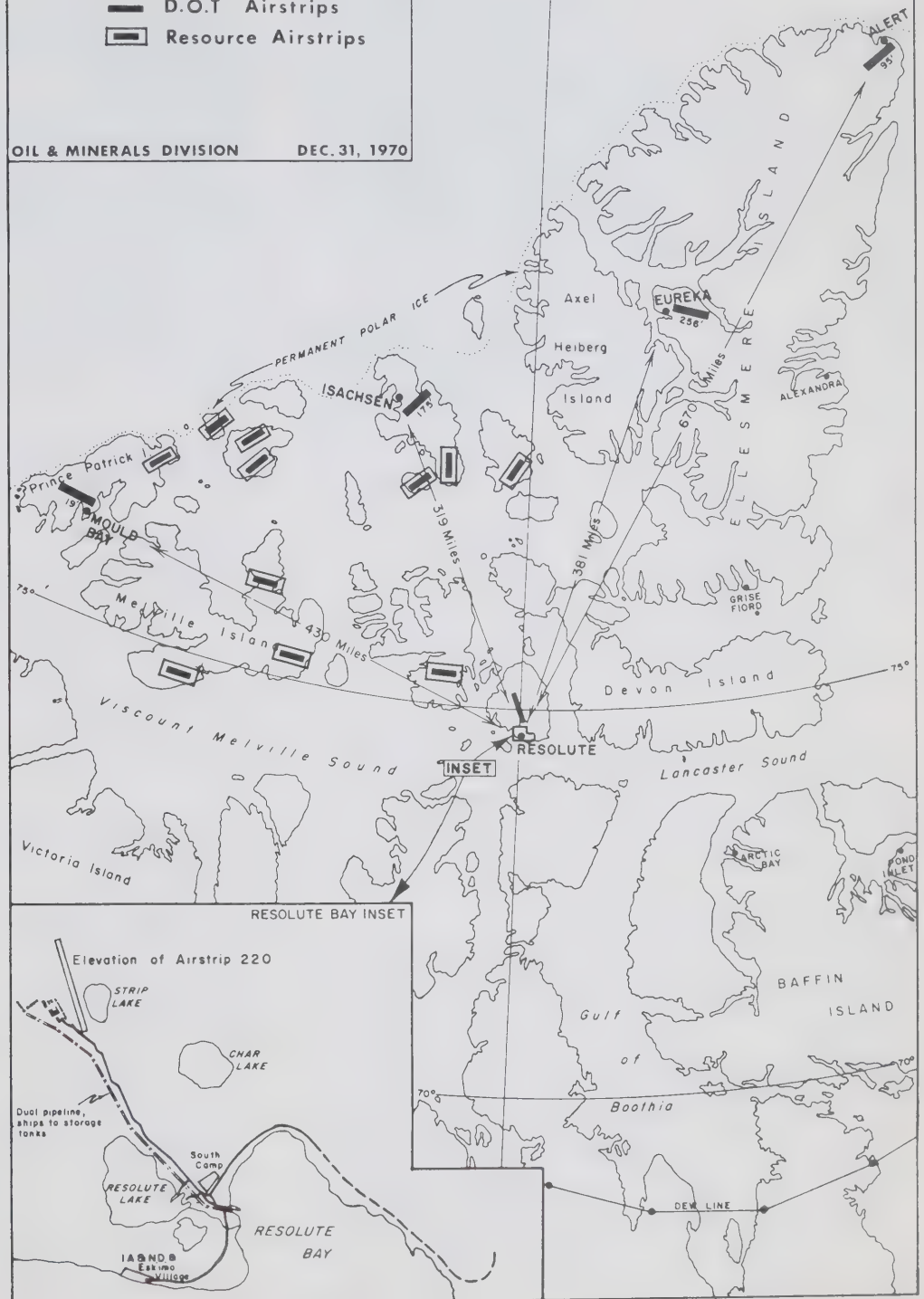
SCALE  
100 50 0 100

## LEGEND

-  Direction of Airstrip
-  95' Elevation of Airstrip
-  430 Air Miles
-  D.O.T Airstrips
-  Resource Airstrips

OIL & MINERALS DIVISION DEC. 31, 1970

Fig. 22





# Appendix II

## Sources of Information Relative to Oil and Gas Activity North of 60°

### Publications

#### A. Maps

Many maps dealing with the northern resource activities are published by the Oil and Minerals Division and are available from the Oil and Gas Land and Exploration Section, Calgary, Alberta, or from the Assistant Director, Oil and Minerals Division, Ottawa. The Division publishes a list of maps which may be obtained from either of the above sources.

#### B. Reports

The following reports may be obtained from Canadian Government Bookstores or the Oil and Gas Land and Exploration Section, Calgary. Pre-payment is required.

Schedule of Wells 1921-1971	— (out of print)
Schedule of Wells 1972	— \$5.00
Schedule of Wells 1973	— 5.00
Schedule of Wells 1974	— 5.00
Schedule of Wells 1975	— 5.00
Oil and Gas Statistical	
Report No. 1 (1920-1960)	— (out of print)
Oil and Gas Statistical	
Report No. 2 (1921-1972)	— (out of print)

“Technical Reports available for Inspection 1975” (Geological and Geophysical Reports released from confidential status are available for public inspection only in the office of the Oil and Gas Land and Exploration Section of this Department in Calgary). — no charge

#### Other Sources of Information

Information on northern resources activities can be obtained from the Assistant Director, Oil and Minerals Division, Department of Indian and Northern Affairs, 400 Laurier Avenue West, Ottawa. All cores and samples from wells drilled on Canada lands north of 60° N. latitude are stored at the Institute of Sedimentary and Petroleum Geology, 3303-33rd St. N.W., Calgary, Alberta. Samples and cores for wells which have been released from confidential status pursuant to the Canada Oil and Gas Land Regulations and the Canada Oil and Gas Drilling and Production Regulations may be inspected at the Institute. A list of such wells may be obtained from the Assistant Director, Oil and Minerals.

Specialized and technical literature pertaining to northern Canada can be purchased at the following government agencies:

**Department of Indian and Northern Affairs,  
Departmental Library, 400 Laurier Avenue West,  
Ottawa, Ontario**

(1) Oil and Gas Land and Exploration Section,  
Department of Indian and Northern Affairs, Calgary.

**Department of Energy, Mines and Resources**

(1) Geological Survey of Canada — Ottawa and  
Vancouver, B.C.

(2) Institute of Sedimentary and Petroleum Geology  
— Calgary, Alberta.

(3) Atlantic Geoscience Centre, Bedford Institute of  
Oceanography — Dartmouth, Nova Scotia.

(4) Earth Physics Branch — Ottawa.

**Defence Research Board, Scientific Information  
Service — Ottawa**

**Transport Canada**

(1) *Canadian Coast Guard* — Ottawa, Ontario  
Branches — Aids and Waterways

— Fleet Systems

— Ship Safety

— Marine Emergency Office

(2) *Telecommunications and Electronics Branch* —  
Edmonton, Alberta and Ottawa, Ontario

(3) *Civil Aviation Branch* — Winnipeg, Manitoba

**Arctic Institute of North America —  
Calgary, Alberta**

**National Research Council —  
Ottawa, Ontario**

**Public Libraries**

The following brochures published by the *Department of Indian and Northern Affairs* may be available in some Public Libraries:

i Guide to Northern Non-Renewable Resources

ii Communication and Transportation Facilities

Queen Elizabeth Group — Arctic Islands

iii Resource Management Division — Responsibilities and Administration

iv Oil and Gas Canada Lands — Volume No. 2

v Oil and Gas Canada Lands — Edition No. 3

vi Oil and Gas in the Yukon and Northwest Territories — Edition No. 4 — 1967

vii Oil and Gas — North of 60 — 1968

viii Oil and Gas — North of 60 — 1969

ix Oil and Gas — North of 60 — 1970

- x Oil and Gas — North of 60 — 1971
- xi Oil and Gas — North of 60 — 1972
- xii Oil and Gas — North of 60 — 1973
- xiii Oil and Gas — North of 60 — 1974
- xiv Prospectus — North of 60

### **Information and Procedures Concerning Operations on Canada Lands**

Certain federal agencies are concerned with exploration on Canada lands and must be notified prior to the commencement of any exploration activity. The operator or permittee, not the contractor, is responsible for providing the requisite advance notice of planned programs to these agencies by writing directly to them.

For offshore programs the Regional Director of Resources at Yellowknife, Northwest Territories, in addition to the Oil and Minerals Division, must be informed with respect to each program. He will communicate with every department and agency on a need-to-know basis with respect to Marine Geophysical Programs. In the case of the Hudson Bay region, operators must also inform the National Research Council of proposed operations to be undertaken during the summer months.

Circumstances may be such that other agencies should be notified as well, and these are listed on the following pages, together with the names of persons who can be of assistance. For example, since operators are responsible for any damage they may cause to underwater commercial cables, it is recommended that they contact the Canadian Hydrographic Service for cable-lay data covering the area over which the work is to be performed. Similarly, the Department of National Revenue, Customs and Excise should be contacted by the importing company if vessels or equipment are to be brought in from abroad.

Information in the brochure "Communications and Transportation Facilities Queen Elizabeth Group, Arctic Islands", is being updated and will be available in a comprehensive report entitled "Operational Guide for Oil and Gas Companies in the North". This publication is now in preparation and should be available by October 1976. In addition to information concerning communications and transportation, the report will contain information covering all aspects of exploration in the North.

### **Department of Indian and Northern Affairs**

Pursuant to Section 52 of the Canada Oil and Gas Land Regulations, "Notice of Commencement of Exploratory Work" must be filed 15 days prior to commencement of proposed exploratory programs (geophysical, geological and research) on the mainland in the Northwest Territories and Yukon Territory and Arctic Islands, and 45 days prior to commencement of geophysical work on offshore areas with the,

Oil and Gas Land and Exploration Section,  
Oil and Minerals Division,  
Department of Indian and Northern Affairs,  
112 — 11th Avenue S.E.,  
CALGARY, Alberta  
T2G 0X5

---

Information and assistance may also be obtained from:

Assistant Director,  
Oil and Minerals Division,  
Northern Natural Resources and  
Environment Branch,  
Department of Indian and Northern Affairs,  
400 Laurier Avenue West,  
OTTAWA, Ontario  
K1A 0H4  
Name: Dr. H. W. Woodward  
Phone: 613-992-9402

or from:

Administrator, Oil and Gas,  
Oil and Minerals Division,  
Department of Indian and Northern Affairs,  
400 Laurier Avenue West,  
OTTAWA, Ontario  
K1A 0H4  
Name: P. Sullivan  
Phone: 613-995-8994

Advice on exploratory programs and operational matters may be obtained from:

Head, Operations Unit,  
Oil and Minerals Division,  
Northern Natural Resources and  
Environment Branch,  
Department of Indian and Northern Affairs,  
400 Laurier Ave. W.  
OTTAWA, Ontario  
K1A 0H4  
Name: S. A. Kanik  
Phone: 613-995-7589

---

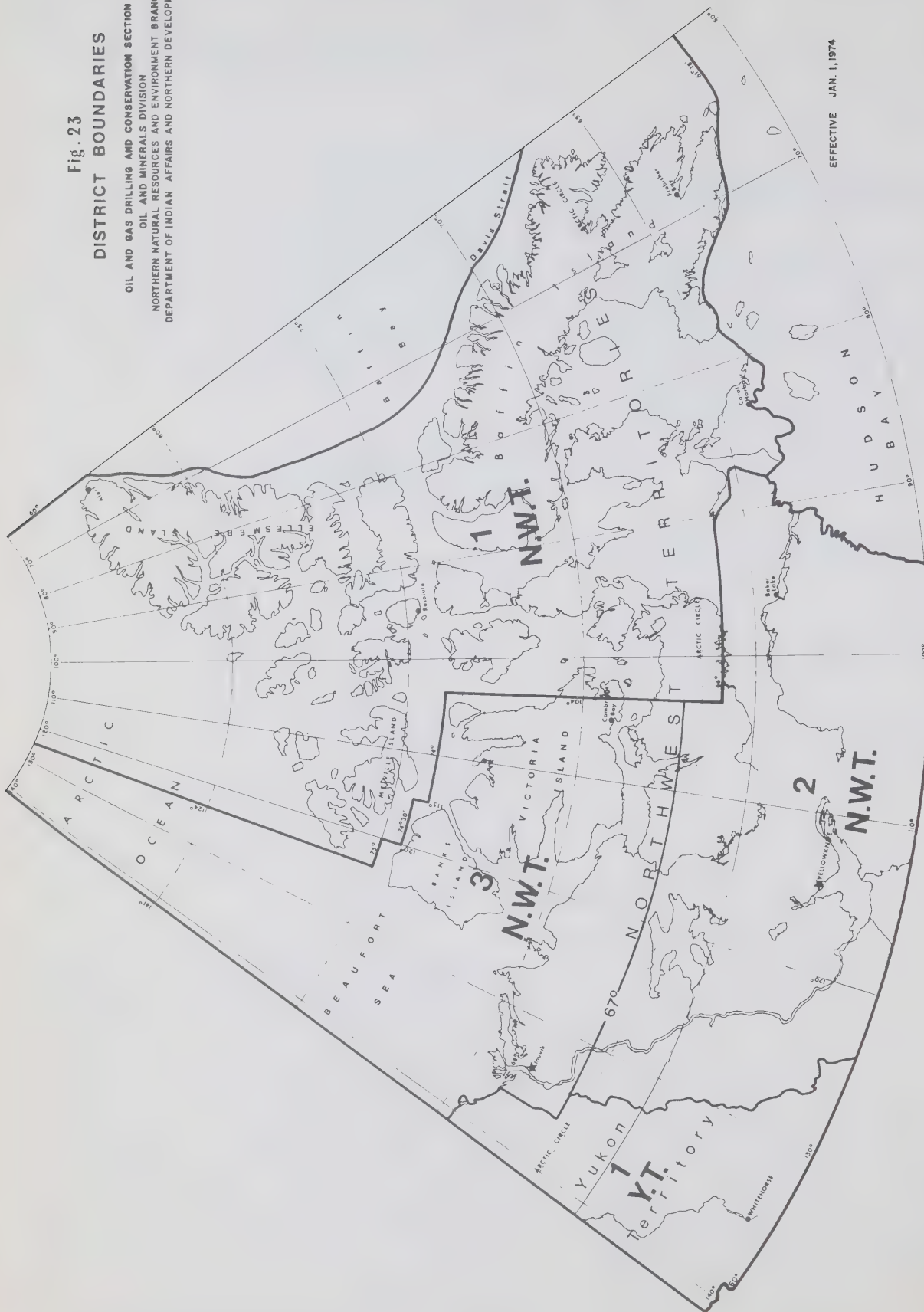
Drilling authority and advice on drilling matters can be obtained from the District Conservation Engineer for the District. See Fig. No. 25 for description of District outlines.

*Oil and Gas Drilling and Conservation Section*  
Chief Petroleum Engineer — T. Boisvert  
Head, Drilling and Completion  
Engineering Unit — M. K. El-Defrawy  
Head, Offshore Petroleum  
Engineering Unit — L. Franklin  
Head, Production Systems  
Engineering Unit — R. L. Price  
Head, Reservoir  
Engineering Unit — T. Baker  
Regional Oil and Gas  
Conservation Engineer, — M. D. Thomas in  
N.W.T. Yellowknife

Fig. 23

# DISTRICT BOUNDARIES

OIL AND GAS DRILLING AND CONSERVATION SECTION  
OIL AND MINERALS DIVISION  
NORTHERN NATURAL RESOURCES AND ENVIRONMENT BRANCH  
DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT



EFFECTIVE JAN. 1, 1974



Regional Oil and Gas  
Conservation Engineer,  
Y.T.

— A. F. Halcrow in  
Whitehorse

District Oil and Gas  
Conservation Engineers

— B. Berry,  
for Arctic Islands  
in Yellowknife,  
District 1, N.W.T.  
— Appointment Pending  
for Southern Sector,  
N.W.T. in Yellowknife,  
District 2, N.W.T.  
— D. Whitehead for the  
N.W. Sector, N.W.T. in  
Inuvik, District 3,  
N.W.T.

---

A Land Use Permit must be acquired for every land use operation, including drilling operations. Advance notice of 90 days is required before the start of drilling operations and all seismic activities, including marine seismic surveys involving the use of high explosives, in the event that qualified observers are needed. Notice of 45 days to the Regional Director is also required before the start of a seismic survey in which a source of accoustical energy other than high explosives is to be used.

Information and advice on the Land Use Regulations and Land Use Permits can be obtained:

*For the Northwest Territories:*

A/Regional Director of Resources,  
P.O. Box 1500,  
YELLOWKNIFE, N.W.T.  
Name: R. Hornal  
Phone: 403-873-4421

*For the Yukon Territory:*

Regional Director of Resources,  
Building 200, Takhini,  
WHITEHORSE, Y.T.  
Y1A 3V1  
Name: B. J. Trevor  
Phone: 403-668-5151

**Department of Energy, Mines and Resources**

*Resource Management and Conservation Branch*

The Resource Management and Conservation Branch is responsible for the administration of federal interest in the mineral resources off Canada's east and west seacoasts and in the Hudson Bay and Hudson Strait regions.

All correspondence should be addressed to:

Director,  
Resource Management and Conservation Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario  
Name: D. G. Crosby  
Phone: 613-995-8655

*Surveys and Mapping Branch*

Information on the systems, methods and equipment utilized in positioning and surveying with respect to exploration work may be subject to review by this agency. Moreover, legal surveys must be made in accordance with instructions of the Surveyor General.

Inquiries concerning surveying may be directed to:

Surveyor General and Director,  
Legal Surveys Division,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario  
K1A 0E9  
Name: D. R. Slessor  
Phone: 613-994-9174

Information concerning control surveys may be obtained from:

Geodetic Survey Division,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario  
K1A 0E9  
Attention: C. E. Hoganson  
Phone: 613-994-5079

When requesting control survey data, the inquiries should define the area involved by latitude and by longitude, and should indicate that the data is required for surveys relating to oil and gas exploration.

Air photographs covering all portions of Canada may be obtained from:

National Air Photo Library,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario  
K1A 0E9  
Attention: P. Andrews  
Phone: 613-994-5457

and

Publications and Air Photo Section,  
Institute of Sedimentary and Petroleum Geology,  
3303-33rd St. N.W.,  
CALGARY, Alberta  
T2L 2A7  
Attention: Mrs. M. H. Brooks  
Phone: 403-284-0110

Topographic maps, indices, charts, atlases and numerous other map publications may be obtained from:

Canada Map Office,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources  
OTTAWA, Ontario  
K1A 0E9  
Attention: G. A. Clemmer  
Phone: 613-998-3865

and

Publications and Air Photo Section,  
Institute of Sedimentary and Petroleum Geology,  
3303-33rd St. N.W.,  
CALGARY, Alberta  
T2L 2A7  
Attention: Mrs. M. H. Brooks  
Phone: 403-284-0110

---

### ***Geological Survey of Canada***

The Geological Survey of Canada carries out systematic geological and geophysical surveys in the sedimentary basins of Canada, including parts of the regions offshore from the east and west coasts, in Hudson Bay, and in the Arctic Islands.

Inquiries with regard to the operations and publications of the Geological Survey should be made to:

Director-General,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario  
K1A 0E8  
Name: D. J. McLaren  
Phone: 613-994-5817

or to:

Director,  
Institute of Sedimentary and Petroleum Geology,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
CALGARY, Alberta  
T2L 2A7  
Name: D. F. Stott  
Phone: 403-284-0110

or to:

Director,  
Atlantic Geoscience Centre,  
Department of Energy, Mines and Resources,  
P.O. Box 1006,  
DARTMOUTH, Nova Scotia  
B2Y 4A2  
Name: B. D. Loncarevic  
Phone: 902-426-2367

### ***Polar Continental Shelf Project***

The Polar Continental Shelf Project is a continuous investigation of the continental shelf fringing the Arctic coast of Canada, together with adjacent parts of the Arctic Ocean basin, the islands of the Canadian Arctic Archipelago and the waters between them, and other areas of special interest.

Inquiries regarding surveys and scientific studies in Arctic areas may be directed to:

Director,  
Polar Continental Shelf Project,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario  
Name: G. Hobson  
Phone: 613-996-3388

---

### ***Earth Physics Branch***

The Earth Physics Branch operates a network of Arctic geophysical observatories and carries out systematic geophysical surveys and studies throughout Canada including the Arctic.

Inquiries with regard to the scientific studies, surveys and publications of the Earth Physics Branch should be directed to:

Director-General,  
Earth Physics Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario  
K1A 0Y3  
Name: K. Whitham  
Phone: 613-994-5253

### ***Department of the Environment***

#### ***Environmental Protection Service***

This agency is advised on a need-to-know basis by the Regional Director of Resources, Department of Indian and Northern Affairs, of any drilling operations and all seismic activities, including marine seismic surveys involving the use of high explosives in the event that qualified observers are needed. Information regarding the Department's requirement can be obtained from:

Assistant Deputy Minister,  
Environment Protection Service,  
Department of the Environment,  
15th Floor, Place Vincent Massey,  
OTTAWA, Ontario  
K1A 0H3  
Name: L. Edgeworth  
Phone: 819-997-1575 or 997-1576

## *Fisheries and Marine Service*

The address of the Regional Director-General responsible for all fresh water lakes in the Northwest Territories is:

Freshwater Institute,  
114 Gary Street,  
WINNIPEG, Manitoba  
Name: Dr. D. H. Lawler,  
Phone: 204-269-7379

In the Yukon Territory is:

1090 West Pender Street,  
VANCOUVER, B.C.  
Name: Dr. G. Green  
Phone: 604-666-1671

---

The *Canadian Hydrographic Service* publishes charts of Canadian coast waters.

Information concerning these may be obtain from:

Canadian Hydrographic Service,  
Department of the Environment,  
615 Booth Street,  
OTTAWA, Ontario  
K1A 0H3  
Name: L. P. Murdoch  
Phone: 613-994-5377

Information concerning charts showing Canada's Territorial Sea and Fishing Zone Limits and related data may be obtained from:

Canadian Hydrographic Service,  
Department of the Environment,  
615 Booth Street,  
OTTAWA, Ontario  
K1A 0H3  
Name: E. J. Cooper  
Phone: 613-994-9330

Commercial Cable-lay data may be obtained from:

Canadian Hydrographic Service,  
Department of the Environment,  
615 Booth Street,  
OTTAWA, Ontario  
K1A 0H3  
Name: J. Bruce  
Phone: 613-994-5141

Information on tides may be obtained from:

Tides, Currents and Water Levels,  
Canadian Hydrographic Service,  
Department of the Environment,  
615 Booth Street,  
OTTAWA, Ontario  
K1A 0H3  
Name: Dr. W. F. Forrester  
Phone: 613-994-9122

Information on hydrographic surveys and control data in the Eastern Arctic may be obtained from:

Regional Hydrographer,  
Canadian Hydrographic Service,  
Atlantic Oceanography Laboratory,  
Bedford Institute,  
DARTMOUTH, Nova Scotia  
B2Y 4A2  
Name: R. C. Melanson  
Phone: 902-426-3497

Information on Hydrographic surveys and control data in the western Arctic may be obtained from:

Regional Hydrographer,  
Canadian Hydrographic Service,  
Ocean and Aquatic Sciences,  
512 Federal Building,  
VICTORIA, B.C.  
Name: M. Bolton  
Phone: 604-388-3188

Information on physical oceanography may be obtained from:

Marine Environmental Data Service,  
Ocean & Aquatic Services,  
Department of the Environment,  
580 Booth Street,  
OTTAWA, Ontario  
K1A 0H3  
Name: Dr. J. R. Wilson  
Phone: 613-995-2007

---

## *Environmental Management Service*

Information concerning wildlife such as the locations of migratory bird sanctuaries and National Wildlife Areas and the Arctic Ecology Maps Series, showing important and critical wildlife areas of the Canadian Arctic where human activities can have adverse or destructive impact on wildlife population may be obtained from:

Director-General,  
Canadian Wildlife Service,  
Department of the Environment,  
16th Floor, Place Vincent Massey,  
OTTAWA, Ontario  
K1A 0H3  
Name: N. G. Perret  
Phone: 819-997-1360

Information concerning research into oil spills in icy waters; stream flow; water levels and quality; permafrost hydrology; flood forecasting; river basin planning, sediment surveys; ice studies; and water demand, supply, use, diversion and conservation; and environmental impact assessment, may be obtained from:



Inlands Waters Directorate,  
Environmental Management Service,  
6th Floor, Place Vincent Massey,  
OTTAWA, Ontario  
K1A 0H3  
Phone: 819-997-3119

---

Information and maps on northern forest and vegetation resources may be obtained from:

Director,  
Forest Management Institute,  
Canadian Forestry Service,  
Department of the Environment,  
396 Cooper St.,  
OTTAWA, Ontario  
K1A 0H3  
Name: Dr. L. Sayn-Wittgenstein  
Phone: 613-996-1674

Director,  
Northern Forest Research Centre,  
Canadian Forestry Service,  
Department of the Environment,  
5320 — 122 Street,  
EDMONTON, Alberta  
T6H 3S5  
Name: Dr. G. T. Silver  
Phone: 403-435-7210

Director,  
Pacific Forest Research Centre,  
Canadian Forestry Service,  
Department of the Environment,  
506 West Burnside Road,  
VICTORIA, B.C.  
V8Z 1M5  
Name: M. H. Drinkwater  
Phone: 604-388-3811

---

#### *Atmospheric Environment Service*

Requests for information and assistance on meteorological and sea-ice data, climatology, weather forecasting, meteorological instruments and research may be directed to:

Assistant Deputy Minister,  
Atmospheric Environment Service,  
Department of the Environment,  
4905 Dufferin Street,  
DOWNSVIEW, Ontario  
M3H 5T4  
Name: J. R. H. Noble  
Phone: 416-667-4760

Information may also be obtained through the Meteorological Liaison Officer in Ottawa. This position is filled on a rotation basis and the name of the officer is subject to change.

Inquiries in Ottawa may be directed to:  
Liaison Meteorologist,  
Department of the Environment,  
Fontaine Building,  
OTTAWA, Ontario  
K1A 0H3  
Name: D. J. Wright  
Phone: 613-997-1588

#### ***Department of National Defence***

##### *Maritime Command*

The appropriate office of Maritime Command will be advised on the need-to-know basis by the Regional Director of Resources of any exploration program proposed for the offshore:

Operations in Baffin Bay and Arctic waters east of longitude 105° West are handled by the office of:

Commander Maritime Command,  
Department of National Defence,  
F.M.O. HMC Dockyard,  
HALIFAX, Nova Scotia

Operations in Arctic waters west of longitude 195° W are handled by the office of:

Commander Maritime Forces Pacific,  
Department of National Defence,  
F.M.O. HMC Dockyard,  
VICTORIA, B.C.

---

##### *Search and Rescue*

The Department of National Defence is responsible for the co-ordination of search and rescue (SAR) operations in Canada. The overall Canadian area of responsibility is divided into four SAR areas as listed below:

##### *Edmonton SAR*

This area includes the three Prairie provinces, all of the Northwest Territories Mainland and Arctic Islands, the western half of Hudson Bay, and Baffin Island north of 70°N.

The contact is:

Edmonton Search and Rescue Region  
Phone: 403-973-8402

##### *Victoria SAR*

This area includes British Columbia, Canadian waters off the west coast, the Yukon Territory and the Beaufort Sea south of 70°N and west of 135°W.

The contact is:

Victoria Search and Rescue Region  
Phone: Victoria — 604-388-1543  
Vancouver — 604-732-4141

### *Halifax SAR*

This area includes Quebec east of 70°W, the Maritime Provinces, Labrador, Canadian waters off the East Coast, Foxe Basin, Hudson Strait and Baffin Island south of 70°N.

The contact is:

Halifax Search and Rescue Region  
Phone: 902-426-4730  
902-426-4735

### *Trenton SAR*

This area includes all of Ontario, Quebec west of 70°W and eastern Hudson Bay and James Bay.

The contact is:

Trenton Search and Rescue Region  
Phone: 613-392-2811 Locals 3870, 3875

Any of the following may also be contacted in case of emergencies: Air Traffic Control Centres, airport control towers, radio stations, marine radio stations, RCMP detachments, provincial and municipal police stations.

The following information is required when making an "Alert Report":

- a. Name of caller, phone number, and official connection, e.g. RCMP detachment commander, aircraft owner, etc.;
  - b. Assistance required;
  - c. Description of aircraft, boat, or whatever craft is involved;
  - d. Full details as to the nature of distress or emergency.
- 

### *Search and Rescue (Marine)*

In addition to the above, the Fleet Systems Branch, Canadian Coast Guard, Transport Canada is responsible for marine search and rescue operations. Contacts may be made at the above contact locations as well as at any Canadian Coast Guard office or marine radio stations.

### *Transport Canada*

*Aids and Waterways Branch* — Marine Aids Division  
At least 60 days notice is required by this Division before the commencement of any offshore exploration program in order that appropriate local Notices to Shipping and national Notices to Mariners may be issued. These Notices are subsequently copied into related foreign publications.

The Division also indicates the requirement of any aids to navigation devices that may be necessary for the program.

Advance notice of 90 days is required in any case where drilling involves the territorial sea, in order for approval to be granted under the Navigable Waters Protection Act.

All communications on these matters should be directed to:

Chief,  
Marine Aids Division,  
Aids and Waterways Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario K1A 0N7  
Phone: 613-992-2736

In addition, there are a number of Departmental officers who may be contacted in the field should the need arise. Their titles and addresses are given below:

- (i) District Manager,  
Canadian Coast Guard,  
Transport Canada,  
101 Boul. Champlain,  
QUEBEC, Quebec  
G1K 4H9  
Phone: 418-694-3420  
(This office handles Hudson Bay)
  - (ii) District Manager,  
Canadian Coast Guard,  
Transport Canada,  
P.O. Box 5002,  
HAY RIVER, N.W.T.  
X0E 0R0  
Phone: 403-874-2406
- 

### *Fleet Systems Branch*

This Branch has major responsibilities in two areas of concern in offshore operations: support of shipping in ice-congested waters, and marine search and rescue.

If operations are being contemplated for areas where ice may be a problem and where ice-breaker or other support may be desired, there should be consultation with the Director, Fleet Systems as long in advance as possible. This is particularly important in the case of Arctic and Hudson Bay operations where the planning of ice-breaker disposition is usually done six months in advance of the navigation season.

Further information and assistance may be obtained from:

Director,  
Fleet Systems Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario  
K1A 0N7  
Name: W. J. H. Stuart  
Phone: 613-992-4209

### *Ship Safety Branch*

This Branch includes the Steamship Inspection Division and the Nautical Division. The responsibilities of the Steamship Inspection Division include inspection and certification of ships under the Canada Shipping Act and the Arctic Waters Pollution Prevention Act. This Division also deals with ship safety and pollution prevention matters arising from ship operations, and the application of the Arctic Shipping Pollution Prevention Regulations.

The Nautical Division deals with marine accident investigation and enquiries, ship registry, salvage, marine personnel and navigation safety matters. At least 60 days notice is required by this Division where drilling operations are planned for areas lying in or near charted ship routes in order for any necessary authority to be issued.

Further information and assistance may be obtained from:

Director,  
Ship Safety Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario  
K1A 0N7  
Name: G. W. R. Graves  
Phone: 613-992-8892

---

### *Marine Emergency Office*

This office is responsible for the marine contingency planning function of the Department of Transport and also supplies co-ordination and assistance when a federal response is made to combat a spill of oil or toxic materials into the marine environment. The response is made under the Interim Federal Contingency Plan, or in the case in international boundary waters, the appropriate Joint International Plan.

Further information and assistance may be obtained from:

Marine Emergency Office,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario  
K1A 0N7  
Name: M. S. Greenham  
Phone: 613-992-9743 or 992-9210

### *Department of Communications*

The responsibilities of this agency include the development of technical standards, the selection and co-ordination of radio frequencies, and the licensing of all classes of radio station except broadcasting.

An operator contemplating the use of radio-communications in his offshore activities should make application for licensing of any radio station in Canada or on board any Canadian vessel involved at least six weeks before the proposed in-service date

of the communication facility. Details as to the licensing requirements and the necessary application forms may be obtained from the following addresses:

In Ottawa:

Director,  
Operations Branch,  
Telecommunication Regulatory Service,  
Department of Communications,  
300 Slater Street,  
OTTAWA, Ontario  
K1A 0C8  
Phone: 613-992-3427 or 992-7259

Companies in Western Canada may contact:

Regional Director, Pacific Region,  
Department of Communications,  
325 Granville Street, Room 300,  
VANCOUVER, B.C.  
V6C 1S5  
Phone: 604-666-1469

Regional Director, Central Region,  
Department of Communications,  
2300 — One Lombard Place,  
WINNIPEG, Manitoba  
R3B 2Z8  
Phone: 204-995-4081

District Manager,  
Department of Communications,  
205 — 8th Avenue S.W., Room 804,  
CALGARY, Alberta  
T2G 0K9  
Phone: 403-262-3058 or 262-3416

District Manager,  
Department of Communications,  
Financial Bldg., Room 300,  
10621 — 100 Avenue,  
EDMONTON, Alberta  
T5J 0B4  
Phone: 403-425-5189

Companies in Northern Canada may contact:

District Manager,  
Department of Communications,  
P.O. Box 540,  
FORT SMITH, N.W.T.  
X0E 0P0  
Phone: 403-872-2187

District Manager,  
Telecommunications Regulations Office,  
Department of Communications,  
Federal Bldg., Room 230,  
WHITEHORSE, Y.T.  
Phone: 403-667-7197



Companies in Eastern Canada may contact:

Regional Director,  
Department of Communications,  
7th Floor,  
Terminal Plaza Building,  
1222 Main Street,  
MONCTON, N.B.  
Phone: 506-858-2213

***National Research Council***

***Space Research Facilities Branch***

Operators planning offshore activities in the Hudson Bay region must inform the following agency of the National Research Council well in advance since rockets are fired on a year round basis from the Churchill Research Range:

Head,  
Range Section,  
Space Research Facilities Branch,  
National Research Council,  
OTTAWA, Ontario  
K1A 0R6  
Name: Z. R. Charko  
Phone: 613-993-9385

Operators active in the Hudson Bay region are also required to co-ordinate their field activities with:

Superintendent,  
Churchill Research Range,  
National Research Council,  
FORT CHURCHILL, Manitoba  
R0B 0K0  
Name: C. R. Barrett  
Phone: 204-856-3010

Rockets are also launched from time to time from the facilities at Resolute Bay, N.W.T. and Cape Parry, N.W.T. Operators with exploration work planned for this vicinity are urged to co-ordinate their activities with the National Research Council.

***Department of National Revenue***

***Customs and Excise***

The Headquarters Operations Directorate administers that portion of the Canada Shipping Act that relates to the coasting trade. In this connection, any company importing ships or specialized plants and equipment for exploration work on Canada's sea-coasts and among the Arctic Islands may obtain information, assistance and such other contacts as may be necessary in Customs and Excise from:

Director-General,  
Headquarters Operations,  
Customs and Excise,  
Department of National Revenue,  
OTTAWA, Ontario  
K1A 0L5  
Name: R. A. McLean  
Phone: 613-992-4952

***Department of Manpower and Immigration***

***Canada Immigration Division***

Inquiries should be directed to:

Chief, Non-Immigrant Control & Special Cases  
Section,  
Facilitation, Enforcement and Control Branch,  
Canada Immigration Division,  
Department of Manpower and Immigration,  
OTTAWA, Ontario  
Name: G. P. Garvin  
Phone: 613-992-0454

The Winnipeg and Edmonton offices of the Department of Manpower and Immigration can answer any queries regarding entry into the Northwest Territories. The Vancouver office can respond to queries for entry into the Yukon Territory.

At Tuktoyaktuk, a local R.C.M.P. officer is also a representative for Manpower and Immigration and can clear entry into Canada via Tuk.

At Inuvik, the Customs Department is also Departmental representative for Manpower and Immigration and can be contacted by telephone if prior arrangements are necessary. There is no representative at Aklavik; in the event that a seismic crew prefers to land at Aklavik, arrangements must be made with the Inuvik representative.

# Appendix III

## To All Permittees and Lessees

### ***Expenditures Relating to Processing and Interpretation of Geophysical Data Acquired on Canada Lands***

An information letter was recently distributed to all Permittees and Lessees advising operators that as from January 1, 1974, expenditures incurred in computer processing and the interpretation of Geophysical Data acquired in the course of exploration activities involving Canada Lands will not be considered eligible for approval as allowable expenditures unless such processing and interpretation has been carried out in Canada.

After January 1, 1974, an operator submitting a claim, pursuant to the *Canada Oil and Gas Land Regulations*, for allowable expenditures involving geophysical operations undertaken on Canada Lands must identify on his statement of expenditure the name of the company or companies involved together with the location of: (a) the computer facilities utilized in the processing of the geophysical data; and (b) the offices wherein interpretation of the geophysical data was undertaken. Expenditures incurred for computer processing must be separately identified and not included as part of the costs incurred for interpretation.

Further in this regard, the processing of geophysical data undertaken on board non-Canadian seismic ships will be considered to be work undertaken outside Canada and not eligible for approval as allowable expenditures.

Director,  
Resource Management  
and Conservation  
Branch  
Department of Energy,  
Mines and Resources.

Chief,  
Oil and Minerals Division  
Northern Natural  
Resources  
and Environment  
Branch,  
Department of Indian  
Affairs and Northern  
Development.

### ***Transfer of Interest — Canada Lands***

The *Canada Oil and Gas Land Regulations* stipulate that no transfer of an oil and gas permit or lease shall pass any interest in a permit or lease until the transfer is registered in accordance with the Regulations, which registration must be approved by the Chief. Please be advised that in future one of the considerations for the approval of the registration of a transfer of any interest in a permit or lease will be that all agreements or an executive summary relating to such transfer of interest have been deposited with the Chief.

All permittees are requested, therefore, to arrange to forward a copy of each current agreement, or an executive summary, to the federal agency concerned at their earliest convenience. In future such agreements should be deposited with the Chief of the appropriate federal agency at the time they are made.

The confidentiality of documents relating to these agreements will of course be maintained until permission to release them is given by the Companies involved.

Director,  
Resource Management  
and Conservation  
Branch.

Assistant Director,  
Oil and Minerals,  
Northern Natural  
Resources  
and Environment  
Branch.

***Importation and Operation of Foreign Vessels***

The importation and operation of vessels coastwise or between Canadian and foreign ports are subject to the Customs Act, the Canada Shipping Act, and Coastwise and Foreign Shipping Regulations and the Customs Tariff. These acts and regulations, Inter Alia, are administered by the Customs and Excise Branch of the Department of National Revenue.

A company wishing to import ships or specialized plant and equipment for exploration work off Canada's seacoasts is requested to make application well in advance of the proposed commencement date of any programme. In order to ensure that the application is processed properly, this department should be advised at least ninety days before the commencement of the programme. This lead time of ninety days is needed to determine the suitability of Canadian-flag vessels declared available to fulfill the purposes respecting which temporary entry is sought.

Each application must state the area of operation and the approximate time span, and contain a description of the salient features of the energy source equipment proposed for the particular operation. Information should also be supplied in respect of all other essential criteria required, including bunker and stores capacity, accommodation, clear deck space, size of instrumentation room, electrical energy additional to vessel's normal operation needs and possible draft restrictions.

Any additional information, assistance and other contacts as may be necessary in Customs and Excise may be obtained from:

Director,  
Port Administration Division,  
Department of National Revenue,  
Customs and Excise,  
OTTAWA, Ontario  
K1A 0L5  
Attention: Marine Rail Transportation  
Tel. 992-2742



# Appendix IV

## Reporting Forms

The Oil and Minerals Division is a member of the “Federal Provincial Committee on Energy Statistics” and the “Mines Ministers Subcommittee on Oil and Gas Statistics” and together with the four western provinces and Statistics Canada has standardized all its oil and gas reporting forms. This standardization has removed duplication between government agencies and more important, industry can now process all oil and gas reporting forms from the western provinces and the Yukon and Northwest Territories on computer machines without change of programs.

<i>Form No.</i>	<i>Title of Form</i>
IAN*52-90-1**	Application for a Drilling Authority
IAN*52-90-2	Well Completion Data
IAN*52-90-3**	Application to Amend a Drilling Authority
IAN*52-90-4**	Application to Change a Well Name
IAN*52-90-5**	Application to Abandon a Well or Suspend Drilling
IAN*52-90-6**	Application to Alter Condition of a Well
IAN*52-90-7	Work-over Report No.
IAN*52-90-8	Application to Commingle Production before Measurement
IAN*52-90-9	Data for Back Pressure Test on Natural Gas Wells-Monograph 7 Method
IAN*52-90-10	Data for Back Pressure Test on Natural Gas Wells-Vitter's Method
IAN*52-90-11	M.P.R. — Oil Calculations
IAN*52-90-12	New Oil Well Report

<i>Form No.</i>	<i>Title of Form</i>
IAN*52-90-13	New Gas Well Report
IAN*52-90-17	New Service Well Report
IAN*52-90-18	Monthly Water Flood Operations Report
IAN*52-90-20	Monthly Water Receipts and Disposal of Fluids Report
IAN*52-90-23	Geologic Surface Survey & Airphoto Analysis — Expenditures
IAN*52-90*24	Land Geophysical Operations — Expenditures
IAN*52-90-25	Marine Geophysical Programs — Expenditures
IAN*52-90-26	Drilling & Structure Test Drilling Expenditures
IAN*52-90-27	Participation Programs — Expenditures

IAN*52-91**	Notice of Commencement of Exploratory Work
IAN*52-91-1**	Notice of Commencement of Research and Development Work
IAN*52-92	Application for Authority to Drill Structure Test Hole
IAN*52-93	Report on Abandonment of Structure Test Hole
IAN*52-83	Grouping Notice
IAN*52-103*	Application for Oil and Gas Lease
IAN*51-183	Monthly Accident Summary

\*To be completed by Operator

\*\*To be completed in triplicate; all other forms to be completed in duplicate

All forms, except IAN 52-83, IAN 52-90-23 to IAN 52-90-27, IAN 52-91, IAN 52-91-1, and 52-103, are submitted to the appropriate District Oil and Gas Conservation Engineer.

Forms IAN 52-83, 52-90-23 to 52-90-27 and 52-103 are submitted to the Oil and Minerals Division, 400 Laurier Avenue West, Ottawa, Ontario. K1A 0H4.

Forms IAN 52-91 and 52-91-1 should be submitted to the Oil and Gas Land and Exploration Section — 112-11th Avenue S.E., Calgary, Alberta. T2G 0X5.

The following forms have been issued pursuant to the *Canada Oil and Gas Land Regulations* and *Canada Oil and Gas Drilling and Production Regulations*. These forms are to be completed when applicable during the production stage of oil and gas wells, and refinery operations.

<i>Form No.</i>	<i>Title of Form</i>
IAN 52-116-1	Monthly Production Report
IAN 52-116-2	Monthly Disposition and Crown Royalty Statement
IAN 52-116-3	Monthly Gas Gathering Statement
DBS 6511-38*	Monthly Oil Pipeline Gathering Operations Statement
IAN 52-116-5	Monthly Crude Oil and Condensate Purchaser's Statement
IAN 52-116-6	Monthly Gas Plant Statement
DBS 6511-37*	Monthly Natural Gas Distributors Statement
IAN 52-116-8	Monthly Gas Processing Plant Products Statement
IAN 52-116-9	Monthly Liquefied Petroleum Gas Purchaser's Statement

- IAN 52-116-10 Monthly Refinery Operations Report
- IAN 52-116-11 Monthly Gas Injection Operations Report
- IAN 52-116-12 Statement of Nomination and Estimated Requirement of Crude Oil, Condensate and Pentanes Plus

Notes:

- (a) All forms to be completed by Operator.
- (b) Forms 6511-37 and 6511-38 are completed by the Operator in triplicate.

He forwards the first two copies to the Oil and Minerals Division in Ottawa, and the third to the District Oil and Gas Conservation Engineer responsible for the District in which the well is located (see Fig. 23). The other forms listed above are completed in duplicate. The original is submitted to the Oil and Minerals Division in Ottawa and one copy to the appropriate District Oil and Gas Conservation Engineer.

# Appendix V

## Selected Geological References

Selected geological references applicable to geological provinces and basins in Northern Canada are listed below. Many others are to be found in the lists of references in Memoir 1 of the Canadian Society of Petroleum Geologists; "The Future Petroleum Provinces of Canada — The Geology and Potential"; Editor R. G. McCrossan, Calgary, 1973. References may also be found in Geol. Surv. Can. Paper 74-3: "1973-1974 Index of Publications of the Geological Survey of Canada".

For a complete list of oil industry technical reports released from confidential status, the reader should refer to the Departmental publication "Technical Reports Available for Inspection — 1975".

### Northwest Territories

Geol. Surv. Can.,  
Memoir 322      Stratigraphy of Middle Devonian and Older Paleozoic Rocks of the Great Slave Lake Region Northwest Territories.  
A. W. Norris

Geol. Surv. Can.,  
Memoir 374      Port Radium Map Area, District of Mackenzie  
G. Mursky

Geol. Surv. Can.,  
Bulletin 95      Carboniferous and Permian Rocks, Southwestern District of Mackenzie  
P. Harker

Geol. Surv. Can.,  
Bulletin 163  
pp. 31-38      "Middle Cambrian Plagiura-Poliella Fannule from Southwest District of Mackenzie"  
B. S. Norford

Geol. Surv. Can.,  
Bulletin 170      Middle Triassic (Anisian) ammonoids from northeastern British Columbia and Ellesmere Is.  
F. H. McLearn

Geol. Surv. Can.,  
Bulletin 185      Barremian Textulariina. Foraminiferida from Lower Cretaceous beds, Mount Goodenough section, Aklavik Range, District of Mackenzie  
T. P. Chamney

Geol. Surv. Can.,  
Paper 58-2

Uppermost Jurassic and Cretaceous Rocks of Aklavik Range, Northeastern Richardson Mountains, Northwest Territories.  
J. A. Jeletzky

Geol. Surv. Can.,  
Paper 58-11

Great Slave and Trout River Map Areas, Northwest Territories (Report and Maps 27-1958 and 28-1958)  
R. J. W. Douglas

Geol. Surv. Can.,  
Paper 61-1

Summary Account of Carboniferous and Permian Formations, Southwestern District of Mackenzie  
P. Harker

Geol. Surv. Can.,  
Paper 61-9

Upper Jurassic and Lower Cretaceous Rocks, West Flank of Richardson Mountains, between the Headwaters of Blow and Bell Rivers  
J. A. Jeletzky

Geol. Surv. Can.,  
Paper 65-32

Geophysical Reconnaissance of Hudson Bay  
Peter Hood

Geol. Surv. Can.,  
Paper 66-50

Jurassic and Triassic Rocks of the Eastern Slope of Richardson Mountains, Northwestern District of Mackenzie  
J. A. Jeletzky

Geol. Surv. Can.,  
Paper 67-8

Preliminary account of the Goulburn Group, Northwest Territories, Canada  
L. P. Tremblay

Geol. Surv. Can.,  
Paper 67-53

Reconnaissance Devonian stratigraphy of northern Yukon Territory and northwestern District of Mackenzie  
A. W. Norris

Geol. Surv. Can.,  
Paper 68-25

Subsurface geology, Lower Mackenzie River and Anderson River area, District of Mackenzie  
E. J. Tassonyi



Geol. Surv. Can., Paper 68-36	Preliminary notes on the Proterozoic Hurwitz Group, Tavani and Kaminack Lake areas, District of Keewatin R. T. Bell	Bulletin of Can., Petroleum Geology Vol. 20, No. 2, pp. 321-361	Ordovician to Devonian History of Northern Yukon and adjacent District of Mackenzie A. C. Lenz
Geol. Surv. Can., Paper 68-42	Stratigraphy of the Lower Proterozoic (Aphebian) Great Slave Supergroup, East Arm of Great Slave Lake, District of Mackenzie P. F. Hoffman	Bulletin of Can., Petroleum Geology Vol. 20, No. 3, pp. 498-548	The Horn Plateau Formation: A Middle Devonian Coral Reef, Northwest Territories, Canada L. K. Vopni and J. F. Lerbekmo
Geol. Surv. Can., Paper 68-47	Sekwi Formation, and new Lower Cambrian formation in the southern Mackenzie Mountains, District of Mackenzie R. C. Handfield	Can. Soc. Petrol. Geol., Memoir 1	Tathlina Area, Southern District of Mackenzie R. de Wit, E. C. Gronberg, W. B. Richards and W. O. Richmond
Geol. Surv. Can., Paper 69-9	Stanton Map-area, (107D) Northwest Territories C. J. Yorath and H. R. Balkwill	Can. Soc. Petrol. Geol., Memoir 1	Anderson Plain, Northern District of Mackenzie David F. Gilbert
Geol. Surv. Can., Paper 70-12	Geology, Colville Lake map-area and part of Coppermine map-area (96 NW and NE, part of 86 NW) Northwest Territories (Report and Map 12-1970) D. G. Cook and J. D. Aitken	Can. Soc. Petrol. Geol., Memoir 1	Beaufort Sea Monti Lerand
Geol. Surv. Can., Paper 70-13	Lower and Middle Devonian stromatoporoids from north-western Canada C. W. Stearn and P. N. Nehrotra	Can. Soc. Petrol. Geol., Memoir 1	Canadian Arctic Islands K. J. Drummond
Geol. Surv. Can., Paper 70-14	Middle Devonian tectonic history of the Tathlina Uplift, southern District of Mackenzie and northern Alberta, Canada H. R. Belyea	Can. Soc. Petrol. Geol., Memoir 1	Labrador Sea and Baffin Bay N. J. McMillan
Geol. Surv. Can., Paper 70-30	Tertiary and Cretaceous Biostratigraphic Divisions in the Reindeer D-27 Borehole, Mackenzie River Delta T. P. Chamney	Can. Petr. April 1974 pp. 72-78	Gulf describes Geology of the Parsons Lake Gas Find R. P. Cote, R. Rector, M. Lerand
Geol. Surv. Can., Paper 70-32	Brock River map area, District of Mackenzie (97D) (Report and Map 13-1970) H. R. Balkwill and C. J. Yorath	Geol. Surv. Can., Paper 71-11	Reconnaissance geology, southern Great Bear Plain, District of Mackenzie (Report and Map 5-1971) H. R. Balkwill
Bulletin of Can. Petroleum Geology Vol. 19, No. 3, pp. 570-588	Facies and Faunal Relations of Edge of Early Mid-Devonian Carbonate Shelf, South Nahanni River Area, N.W.T. J. P. A. Noble and R. D. Ferguson	Geol. Surv. Can., Paper 71-15	Biostratigraphic determinations of fossils from the subsurface of the Yukon Territory and the District of Mackenzie B. S. Norford, M. S. Barss, W.W. Brideaux, T. P. Chamney, W. H. Fritz, William S. Hopkins, Jr., J. A. Jeletzky, A. E. H. Pedder and T. T. Uyeno
Geol. Surv. Can., Maps 1316A, 1317A, 1318A	Oil and Gas Pools of Western Canada N. L. Ball	Geol. Surv. Can., Paper 72-19	Description of Carboniferous and Permian stratigraphic sections, northern Yukon Territory and Northwestern District of Mackenzie E. W. Bamber

Geol. Surv. Can., Paper 72-38	Biostratigraphic determinations of fossils from the subsurface of the Yukon Territory and the Districts of Franklin, Keewatin and Mackenzie B. S. Norford, W. W. Brideaux, T. P. Chamney, M. J. Copeland, Hans Frebold, William S. Hopkins, Jr., J. A. Jeletzky, B. Johnson, D. C. McGregor, A. W. Norris, A. E.H. Pedder, E. T. Tozer and T. T. Uyeno	Inter Sym. on Dev. System A.S.P.G.	Devonian of northern Yukon Territory and adjacent District of Mackenzie A. W. Norris
Geol. Surv. Can., Paper 73-9	Reconnaissance studies of Proterozoic and Cambrian Stratigraphy, Lower Mackenzie River J. D. Aitken, R. W. MacQueen, J. L. Usher	Bulletin of Can. Petroleum Geology Vol. 18, No. 1, pp. 67-79	Ramparts, Beavertail and other Devonian Formations C. H. Crickmay
Geol. Surv. Can., Paper 74-14	Palynology of an Upper Cretaceous section, Horton River, District of Mackenzie D. J. McIntyre	Bulletin of Can. Petroleum Geology Vol. 18, No. 1, pp. 80-83	Clay-Mineralogy and Boron Determinations of the Shales from the Reindeer Well, Mackenzie River Delta P. Bayliss and A. A. Levinson
Geol. Surv. Can., Paper 74-16	Jurassic and Lower Cretaceous Paleogeography and Depositional Tectonics of Porcupine Plateau, Adjacent Areas of Northern Yukon and those of Mackenzie District J. A. Jeletzky	Bulletin of Can. Petroleum Geology Vol. 19, No. 2, pp. 437-484	Regional Devonian Geology and Oil and Gas Possibilities, Upper Mackenzie River Area James Law
Geol. Surv. Can., Paper 74-34	Lower Paleozoic Franklin Mountain and Mount Kindle Formations, District of Mackenzie: Their Type Sections and Regional Development B. S. Norford, R. W. MacQueen	Bulletin of Can. Petroleum Geology Vol. 22, No. 3, pp. 340-353	Naturally occurring Gas Hydrates in the Mackenzie Delta N.W.T. C. Bily, J. W. L. Dick
Geol. Surv. Can., Paper 74-36	Franklin Bay and Malloch Hill Map Areas, District of Mackenzie C. J. Yorath, H. R. Balkwill, R. W. Klassen	Geol. Surv. Can., Paper 70-15	Biostratigraphic determinations of fossils from the subsurface of the Yukon Territory and the Districts of Mackenzie and Franklin B. S. Norford, W. K., Braun, T. P. Chamney, W. H. Fritz, D. C. McGregor, A. W. Norris, A. E. H. Pedder and T. T. Uyeno
Geol. Surv. Can., Paper 74-40	Geology of the Lower Paleozoic Formations in the subsurface of the Fort Simpson Area, District of Mackenzie, N.W.T. N. C. Meijer — Drees	Geol. Surv. Can., Paper 71-15	Biostratigraphic determinations of fossils from the subsurface of the Yukon Territory and the District of Mackenzie B. S. Norford, M. S. Barss, W. W. Brideaux, T. P. Chamney, W. H. Fritz, Williams S. Hopkins, Jr., J. A. Jeletzky, A. E. H. Pedder and T. T. Uyeno
Can. Jour. of Earth Sc. Vol. 12, 1975 pp. 663-698	Ordovician Formations and Fauna, Southern Mackenzie Mountains R. Ludvigsen	Geol. Surv. Can., Paper 74-10	Contribution to the Jurassic and Cretaceous Geology of the Northern Yukon Territory and District of Mackenzie J. A. Jeletzky
Inter Sym. on Dev. System A.S.P.G.	Upper Devonian ostracod faunas of Great Slave Lake and north-western Alberta, Canada W. K. Braun	Geol. Surv. Can., Paper 74-23	Palynology of Two Sections of Late Quaternary Sediments from the Porcupine River, Yukon Territory S. Lichi-Federovich
Inter Sym. on Dev. System A.S.P.G.	Ambocoeliid brachiopods from the Middle Devonian rocks of northern Canada W. G. E. Caldwell	Inter Sym. on Dev. System A.S.P.G.	Upper Silurian and Lower Devonian biostratigraphy, Royal Creek, Yukon Territory, Canada A. C. Lenz

Bulletin of Can. Petroleum Geology Vol. 18, No. 3, pp. 407-429	Age and Fauna of the Michelle Formation, Northern Yukon Territory R. Ludvigsen	Geol. Surv. Can., Paper 67-53	Reconnaissance Devonian stratigraphy of Northern Yukon Territory and Northwestern District of Mackenzie A. W. Norris
Bulletin of Can. Petroleum Geology Vol. 19, No. 1, pp. 29-249	Carboniferous and Permian Stratigraphy and Paleontology, Northern Yukon Territory, E. W. Bamber and J. B. Waterhouse	Geol. Surv. Can., Paper 68-18	Stratigraphy and Palynology of a Permian Section, Tatonduk River, Yukon Territory E. W. Bamber and M. S. Barss
Proc. of 1973 Nat. Convention of CSEG pp. 46-47	Tectonic Framework of the Mackenzie Delta determined from Gravity Data G. K. Sirrine	Geol. Surv. Can., Paper 68-26	Lower Cretaceous (Albian) of the Yukon, Stratigraphy and Forameniferal subdivisions, Snake and Peel Rivers E. W. Mountjoy and T. P. Chamney
Arctic Geology AAPG Memoir 19(1973)	Tectonics of Northern Franklin Mountains and Colville Hills, District of Mackenzie, Canada D. G. Cook and J. D. Aitken	Bulletin of Can., Petroleum Geology Vol. 21, No. 1, pp. 123-130	Geology of Crow River — Spring River Area, British Mountain Front, Yukon W. O. Kupsch
Canada's Continental Margins CSPG Memoir 4 pp. 613-633	Geology of the Lower Cretaceous Parsons Lake Gas Field, Mackenzie Delta, Northwest Territories R. P. Cote, M. M. Lerand, R. J. Rector	Bulletin of Can., Petroleum Geology Vol. 21, No. 1, pp. 81-116	Regional Geology of Northern Yukon A. D. Miall
Canada's Continental Margins CSPG Memoir 4 pp. 633-649	The Regional Setting of the Taglu Field T. J. Hawkings, W. G. Hatlelid	Can. Soc. Petrol. Geol. Memoir 1	Old Crow Basin J. R. Lawrence
Canada's Continental Margins CSPG Memoir 4 pp. 791-821	Some Remarks on Regression and Transgression in Deltaic Sediments G. Daillly	Proc. of Symposium on Geology of the Canadian Arctic pp. 23-38	Late Paleozoic Orogeny in the Northern Yukon J. S. Bell
<b>Eagle Plain and Northern Yukon</b> Geol. Surv. Can., Memoir 247	Physiography of the Canadian Cordillera with a Special Reference to the Area North of The Fifty-Fifth Parallel H. S. Bostock	Proc. of Symposium of Geology of the Canadian Arctic	Carboniferous and Permian Stratigraphy, Southern Eagle Plain, Yukon Territory A. D. Graham
Geol. Surv. Can., Paper 61-9	Upper Jurassic and Lower Cretaceous Rocks, West Flank of Richardson Mountains between the Headwaters of Blow and Bell Rivers, Yukon Territory J. A. Jeletzky	<b>Southern Yukon</b> Can. Soc. Petrol. Geol. Memoir 1	Central Cordilleran Region N. Gale Koch
Geol. Surv. Can., Paper 63-39	Reconnaissance of the Ordovician and Silurian Rocks of Northern Yukon Territory B. S. Norford	<b>Sverdrup Basin</b> Geol. Surv. Can., Memoir 320	Geology of the North Central Part of the Arctic Archipelago, Northwest Territories (Operation Franklin) Y. O. Fortier et al
Geol. Surv. Can., Paper 66-39	Descriptions of Devonian Sections in Northern Yukon and Northwestern District of Mackenzie A. W. Norris	Geol. Surv. Can., Memoir 331	Geological Reconnaissance of Northeastern Ellesmere Island, District of Franklin R. L. Christie
		Geol. Surv. Can., Memoir 332	Western Queen Elizabeth Islands, Arctic Archipelago E. T. Tozer & R. Thorsteinsson



Geol. Surv. Can., Memoir 378	Geology of the Bathurst Island Group, and Byam Martin Island, Arctic Canada J. Wm. Kerr	GSC Bull 171	Pre-Mississippian Geology of Northern Axel Heiberg and NW Ellesmere Island, Arctic Archipelago H. P. Trettin
Geol. Surv. Can., Paper 60-7	Summary Account of Structural History of the Canadian Arctic Archipelago since Precambrian Time R. Thorsteinsson and E. T. Tozer	GSC Bull 183	Geology of Ordovician to Pennsylvanian Rocks, M'Clintock Inlet, north coast of Ellesmere Island, Arctic Archipelago H. P. Trettin
Geol. Surv. Can., Paper 63-30	Mesozoic and Tertiary Strati- graphy, Western Ellesmere Island and Axel Heiberg Island E. T. Tozer	GSC Bull 203	Geology of Lower Paleozoic formations, Hazen Plateau and southern Grant Land Mountains, Ellesmere Island, Arctic Archipelago H. P. Trettin
Geol. Surv. Can., Paper 66-34	Lower Triassic Tar Sands of Northwestern Melville Island, Arctic Archipelago H. P. Trettin and L. V. Hills	GSC Bull 224	Carboniferous and Permian Stratigraphy of Axel Heiberg Island and Western Ellesmere Island, Canadian Arctic Archipelago R. Thorsteinsson
Geol. Surv. Can., Paper 66-55	Ordovician Stratigraphic Section at Daly River, Northeast Ellesmere Island, District of Franklin B. S. Norford	Geol. Surv. Can., Bull. 237	Carboniferous Ammonoids and Stratigraphy in the Canadian Arctic Archipelago W. W. Nassichuk
Geol. Surv. Can., Paper 67-27 pt 1	Stratigraphy of Central and Eastern Ellesmere Island, Arctic Canada, Proterozoic and Cambrian J. Wm. Kerr	Geol. Surv. Can., Bull. 243.	The Jurassic Faunas of the Canadian Arctic H. Frebold
Geol. Surv. Can., Paper 67-27 pt 11	Stratigraphy of Central and Eastern Ellesmere Island, Arctic Canada; Ordovician J. Wm. Kerr	GSC Map 10-1968	Southern Ellesmere Island, District of Franklin J. Wm. Kerr
Geol. Surv. Can., Paper 68-16	Ellef Ringnes Island, Canadian Arctic Archipelago D. F. Stott	Department of Energy, Mines & Resources	Glacier map of northern Queen Elizabeth Islands (District of Franklin) scale 1:1,000,000 W. E. Kenock and A. Stanley
Geol. Surv. Can., Paper 68-17	Mesozoic and Tertiary strati- graphy at Lake Hazen, northern Ellesmere Island, District of Franklin A. A. Petryk	Bulletin of Can. Petroleum Geology Vol. 12, No. 3 Sept. 1964	Piercement Structures in the Arctic Islands Don B. Gould & George de Mille
Geol. Surv. Can., Paper 68-31	Upper Paleozoic and Mesozoic Stratigraphy in the Yelverton Pass Region, Ellesmere Island, District of Franklin W. W. Nassichuk and R. L. Christie	Bulletin of Can. Petroleum Geology Vol. 13, No. 1, March 1965	Lower Paleozoic Salt, Canadian Arctic Islands R. H. Workum
Geol. Surv. Can., Paper 68-44	Analysis of aeromagnetic data over the Arctic Islands and Continental Shelf of Canada B. K. Bhattacharyya	Bulletin of Can. Petroleum Geology Vol. 19, No. 3, pp. 659-679	Geology of the Sverdrup Basin B. P. Plauchut
Geol. Surv. Can., Paper 71-72	Reconnaissance of Lower Paleozoic geology, Phillips Inlet region, north coast of Ellesmere Island, District of Franklin H. P. Trettin		

Bulletin of Can. Petroleum Geology Vol. 19, No. 4, pp. 705-729	Upper Devonian Stratigraphy, Northeastern Banks Island N.W.T. J. E. Klován and A. F. Embry 111	Proc. of Symposium on Geology of the Canadian Arctic pp. 143-158	Lithologies and Depositional Environments of the Allen Bay Read Bay Formations (Ordovician-Silurian) on Svendsen Peninsula, Central Ellesmere Island U. Mayr
Bulletin of Can. Petroleum Geology Vol. 19, No. 4 pp. 730-781	A Late Devonian Reef Tract on Northeastern Banks Island, N.W.T. Ashton F. Embry III and J. E. Klován	Proc. of 1973 Nat. Convention of CSEG pp. 79-89	The Geology of the Canadian Arctic Islands D. L. Campbell
Bulletin of Can. Petroleum Geology Vol. 19, No. 4, pp. 782-798	Brachiopoda of the Melville Island Group (Upper Devonian), Banks Island, N.W.T. Jonathan W. Harrington	Can. Journal Earth Sciences Vol. 10, No. 8, pp. 1337-1339	Upper Cretaceous Marine Strata on Somerset Island, N.W.T. Dixon, J., Hopkins, W. S., Jr., and Dixon, C.A.
Bulletin of Can. Petroleum Geology Vol. 19, No. 4, pp. 799-811	Upper Devonian Megaspores, Northeastern Banks Island, N.W.T. L. V. Hills, R. E. Smith, and A. R. Sweet	Canada's Continental Margins CSPG Memoir 4 pp. 531-545	The Northwest Margin of the Sverdrup Basin R. A. Meneley, D. Hanao, R. K. Merritt
Bulletin of Can. Petroleum Geology Vol. 19, No. 4, pp. 812-813	Mineralogy of the Upper Devonian Strata Along North- eastern Banks Island, N.W.T. P. Bayliss	Canada's Continental Margins CSPG Memoir 4 pp. 545-557	Hydrocarbon Source Potential of Sediments in the Sverdrup Basin D. A. Baker, H. A. Illich, S. J. Martin, R. R. Landin
Bulletin of Can. Petroleum Geology Vol. 23, No. 1, pp. 84-109	Geological History of the Northwest Passage H. D. Daae, A. T. C. Rutgers	<b>Arctic Coastal Plains and Continental Shelf</b> Geol. Surv. Can., Paper 63-22	Marine Geology, Eastern Part of Prince Gustaf Adolf Sea, District of Franklin J. L. Marlowe
Bulletin of Can. Petroleum Geology Vol. 23, No. 1, pp. 131-172	Regional Organic Metamorphism in the Mesozoic Strata of the Sverdrup Basin L. R. Snowdon, K. J. Roy	Geol. Surv. Can., Paper 68-27	Geology of the eastern part of the northern interior and Arctic Coastal Plains, Northwest Territories C. J. Yorath, H. R. Balkwill and R. W. Klassen
Can. J. Earth Sci. Vol. 18, No. 4, pp. 463-468	Geology of an outstanding aerial photograph at Cape Storm, Southern Ellesmere Island, Arctic Canada J. Wm. Kerr	AAPG Memoir 8 pp. 183-214	Piercement structures in Cana- dian Arctic Islands (In Diapirism and diapirs — a symposium: American Association of Petroleum Geologists) D. B. Gould and G. de Mille
Proc. of Symposium on Geology of the Canadian Arctic pp. 259-276	Microplankton Palynostrati- graphy of the Savik Formation (Jurassic), Axel Heiberg and Ellesmere Islands C. D. Johnson	Bulletin of Can. Petroleum Geology Vol. 20, No. 1 pp. 175-183	Geology of outstanding Arctic aerial photographs, Schei Summit area, Central Ellesmere Island J. Wm. Kerr
Proc. of Symposium on Geology of the Canadian Arctic pp. 203-220	Cretaceous and Tertiary Strati- graphy Northern Banks Island G. Jutland and B. P. Plauchut	In Journal of Glaciology, Vol. 8, No. 52, pp. 23-50	Glacial features of Tanquary Fiord and adjoining areas of northern Ellesmere Island, N.W.T. G. Hattersley-Smith
		Oilweek, Vol. 20, No. 1, pp. 73-75	Bright glitter of Arctic black gold H. Heise

Canada's Continental Margins CSPG Memoir 4 pp. 589-613	The Tectonic Development of the Southern Beaufort Sea and its Relationship to the Origin of the Arctic Ocean Basin C. J. Yorath and D. K. Norris	Geol. Surv. Can., Paper 69-8	Ordovician and Silurian biostrati- graphy of the Sogepet-Aquitaine Kaskattama Provine No. 1 well, northern Manitoba B. S. Norford
Can. Jour. of Earth Sc. Vol. 12, 1975 pp. 378-395	Gravity and Deep Structure of the Continental Margin of Banks Island and Mackenzie Delta L. W. Sobczak	Geol. Surv. Can., Bulletin 164	Silurian cephalopods of James Bay Lowland, with a revision of the family Narthecoceratidae R. H. Flower
Inter Symp. on Dev. System A.S.P.G.	Devonian of the Franklin miogeosyncline and adjacent Central Stable Region, Arctic Canada J. W. Kerr	In. Can. Journal of Earth Sciences, Vol. 5, No. 5 pp. 1297-1303	An Analysis of the crust-mantle boundary in Hudson Bay from gravity and seismic observations J. R. Weber and A. K. Goodacre
Inter Symp. on Dev. System A.S.P.G.	Devonian of the Franklinian eugeosyncline H. P. Trettin	<b>Additional Maps</b> GSC Map 1298A	Slidre Fiord Map-Area, Ellesmere Island, Canadian Arctic Archipelago R. Thorsteinsson
Bulletin of Can. Petroleum Geology Vol. 20, No. 4, pp. 651-658	Permian-Triassic Boundary in the Canadian Arctic Archipelago W. W. Nassichuk, R. Thorsteinsson and E. T. Tozer	GSC Map 1299A	Middle Fiord Map-Area, Arctic Islands R. Thorsteinsson
Symp. on Geology of the Canadian Arctic, Program & Abstract p. 7	Upper Paleozoic Carbonate Mounts of the Sverdrup Basin, Arctic Canada G. R. Davies & W. W. Nassichuk	GSC Map 1300A	Eureka Sound south Map-Area, Arctic Islands R. Thorsteinsson
Proc. of Symposium on Geology of the Canadian Arctic pp. 127-142	Stratigraphy and Sedimentary History of Early Paleozoic Rocks from Prince of Wales, and Somerset Islands, Northwest Territories J. Dixon	GSC Map 1301A	Strand Fiord Map-Area, Arctic Islands R. Thorsteinsson
<b>Hudson Bay Basin and Lowlands</b> Geol. Surv. Can., Paper 59-13	Aeromagnetic Surveys Across Hudson Bay from Churchill to Coral Harbour and Churchill to Great Whale River M. E. Bower	GSC Map 1302A	Eureka Sound north Map-Area, Arctic Islands R. Thorsteinsson
Geol. Surv. Can., Paper 60-20	Belcher Islands, Northwest Territories G. D. Jackson	GSC Map 1303A	Haig-Thomas Island Map-Area, Arctic Islands R. Thorsteinsson
Geol. Surv. Can., Paper 67-24	Stratigraphic sections of Paleozoic Rocks on Prince of Wales and Somerset Islands, District of Franklin, N.W.T. R. L. Christie	GSC Map 1304	Glacier Fiord Map-Area, Arctic Islands R. Thorsteinsson
Geol. Surv. Can., Paper 67-60	Geology of the Hudson Bay Lowlands, Operations Winisk B. V. Sanford, A. W. Norris and H. H. Bostock	GSC Map 1305A	Cape Stallworthy Map-Area, Arctic Islands R. Thorsteinsson
		GSC Map 1306A	Tanquary Fiord Map-Area, Arctic Islands R. Thorsteinsson
		GSC Map 1307A	Strathcona Fiord Map-Area, Arctic Islands R. Thorsteinsson
		GSC Map 1373A	Wrigley Area; District of Mackenzie R. J. W. Douglas, D. K. Norris



- GSC Map 1359A      Geology, Kennedy Channel and Lady Franklin Bay, District of Franklin  
J. Wm. Kerr
- Foxe Basin and Baffin Island**
- Geol. Surv. Can., Paper 62-35      Notes with Map 3 — 1958 and Map 4 — 1958 (Fury and Hecla Strait; Foxe Basin North)  
R. G. Blackadar
- Geog. Bull. 4 pp. 1-29      The Island in Foxe Basin;  
Geo. Br. Department of Mines and Technical Surveys
- Geol. Surv. Can., Paper 64-47      Lower Paleozoic Sediments of Northwestern Baffin Island, District of Franklin  
H. P. Trettin
- Maritime Sediments, Vol. 4, No. 1, pp. 4-6      Sedimentological survey of Baffin Bay  
J. J. Blee
- Geol. Surv. Can., Bull. No. 157      Lower Paleozoic sediments of Northwestern Baffin Island  
H. P. Trettin
- Can. Journal of Earth Sciences Vol. 9, No. 3      Geophysical Studies in Baffin Bay and some Tectonic implications  
C.E. Keen, D. L. Bassett, K. S. Manchester, and D. I. Ross
- Map      Glacier map of southern Baffin Island and Northern Labrador Peninsula  
(Department of Energy, Mines and Resources)  
(scale 1:1,000,000) 1968
- AAPG Foundation Issue: East Coast Offshore Symposium pp. 1089-1109      Baffin Bay: Small Ocean Basin formed by Sea Floor Spreading  
C. E. Keen, M. J. Keen, D. I. Ross and M. Lack
- Can. Jour Earth Sciences Vol. 10, No. 7, pp. 1267-1278      Structural Characteristics of some Sedimentary Basins in Northern Baffin Bay  
C. E. Keen and D. L. Barrett
- Geol. Surv. Can., Open File 236      A report on measured stratigraphic sections and reconnaissance studies of the geological structure in widely separated areas of Foxe Basin, Melville Peninsula and Baffin Island.
- In Journal of Paleontology Vol. 43, No. 1, pp. 28-40      Permian Strophomenidae (Brachiopoda) from the Canadian Arctic Archipelago  
J. B. Waterhouse
- Can. Journal of Earth Sciences Vol. 9, No. 6,      Geophysical and Geological Studies in Eastern and Northern Baffin Bay and Lancaster Sound  
M. S. Keen, S. Johnson, I. Park
- Canada's Continental Margins CSPG Memoir 4 pp. 411-433      Geophysical Result from the Continental Margin off Southern Baffin Island  
A. C. Grant
- Canada's Continental Margins CSPG Memoir 4 pp. 453-477      Evolution and Geology of Western Baffin Bay and Davis Strait, Canada  
R. L. Beh
- Franklin Geosyncline**
- Geol. Surv. Can., Memoir 294      Cornwallis and Little Cornwallis Islands, District of Franklin, Northwest Territories  
R. Thorsteinsson
- Geol. Surv. Can., Memoir 309      Permian Rocks and Fauna of Grinnel Peninsula, Arctic Archipelago  
P. Harker and R. Thorsteinsson
- Geol. Surv. Can., Memoir 316      Triassic Stratigraphy and Fauna, Queen Elizabeth Islands, Arctic Archipelago  
E. T. Tozer
- Geol. Surv. Can., Memoir 330      Banks, Victoria and Stefansson Islands, Arctic Archipelago (Report and Map 1135A)  
R. Thorsteinsson and E. T. Tozer
- Bulletin Canadian Petroleum Geology Vol. 13, No. 1      Middle Ordovician to Middle Silurian Carbonate Cycle, Brodeur Peninsula, Northwestern Baffin Island  
H. P. Trettin
- Bulletin Canadian Petroleum Geology Vol. 15, No. 1      New Nomenclature of Ordovician Rock Units of the Eastern and Southern Queen Elizabeth Islands, Arctic Canada  
J. Wm. Kerr
- In Arctic Vol. 21, No. 2, pp. 84-91      The Peel Sound Formation (Devonian of Prince of Wales and adjacent Islands) — a preliminary report  
D. S. Broad et al
- In Can. Journal of Earth Science, Vol. 5, No. 4, pt. 1, pp. 791-799      Sedimentary and paleontological features of the Tertiary-Cretaceous rocks of Somerset Island, Arctic Canada  
D. L. Dineley and B. R. Rust
- In Journal of Paleontology Vol. 43, No. 1, pp. 1-27      Yukon Territory and Devon Island, Canada, with a section on Devon Island stratigraphy, by A. R. Ormiston, G. Clapper

GCS Map 6-1969 (with notes)	Lac Belot map-area, Northwest Territories J. D. Aitken and D. G. Cook	Arctic Geology AAPG Memoir 19 (1973) pp. 41-47	Geology of Beaufort-Mackenzie Basins and Eastern Part of Northern Interior Plains C. J. Yorath
Journal of Paleontology	Helicoprion sp. and Ellasmon- branch found in Permian rocks on Ellesmere Island, Canadian Arctic W. W. Nasichuk and Claude Spinosa	<b>Arctic Lowlands</b> Geol. Surv. Can., Paper 63-44	Surficial Geology of Boothia Peninsula and Somerset, King William and Prince of Wales Islands, District of Franklin B. G. Craig
In Maritime Sediments Vol. 4, No. 2, pp. 69-72	The submersible PICES feasi- bility study in the Canadian Arctic B. R. Pelletier	Geol. Surv. Can., Paper 64-47	Lower Paleozoic Sediments of Northwestern Baffin Island, District of Franklin H. P. Trettin
Bull. Geol. Soc. Am. Vol. 80, No. 1, Jan. 1969 pp. 143-148	A Paleozoic-Tertiary Fold Belt in northernmost Ellesmere Island aligned with the Lomono- sov Ridge H. P. Trettin	Geol. Surv. Can., Paper 73-10	Three new Lower Paleozoic Formations of the Boothia Peninsula region, Canadian Arctic Archipelago R. L. Christie
In Micro- paleontology Vol. 15, No. 1, pp. 35-60	Recent foraminifera in the Cana- dian Arctic G. Vilks		
Geol. Surv. Can., Paper 72-37	Description, Palynology and Paleoecology of the Hassal Formation (Cretaceous) on eastern Ellef Ringnes Island, District of Franklin W. S. Hopkins, Jr., and H. R. Balkwill		
Geol. Surv. Can., Paper 71-21	Massive ice and icy sediments throughout the Tuktoyaktuk Peninsula, Richards Island, and nearby areas, District of Mackenzie V. N. Rampton and J. Ross Mackay		
Geol. Surv. Can., Open File 193	Upper Cretaceous stratigraphy, Yukon coastal plain and north- western Mackenzie Delta F. G. Young		
Geol. Surv. Can., Open File 251	Geology of the Beaufort Mac- kenzie Basin C. J. Yorath, D. W. Myhr and F. G. Young		
Defense Research Board	Ice Atlas of Arctic Canada C. Swithinbank		
Proc. of Symp. on Geology of the Canadian Arctic pp. 5-22	Global Tectonics and the Cana- dian Arctic Continental Shelf R. St. J. Lambert		
Can. Jour. Earth Sciences Vol. 12, No. 3, pp. 378-394	Gravity and Deep Structure on the Continental Margin of Banks Island and Mackenzie Delta L. W. Sobczak		















Indian and  
Northern Affairs

Affaires indiennes  
et du Nord

North of 60

CAI  
IA61  
- 032

Oil and Gas  
Activities 1976





# Oil and Gas Activities 1976

Government  
Publication

(Edition No. 13)

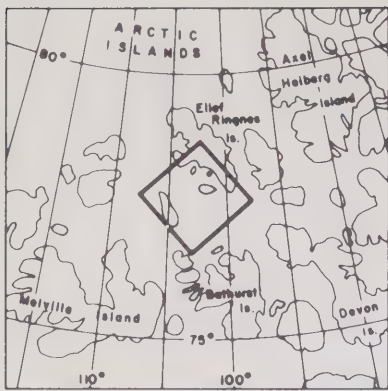
**Report on  
the Activities in 1976  
of the Oil and Gas Industry  
in the Yukon Territory  
and Northwest Territories**

Compiled by  
Oil and Gas Exploratory Operations Section  
Northern Non-Renewable Resources Branch  
Department of Indian and Northern Affairs





Published under authority of the  
Hon. J. Hugh Faulkner,  
Minister of Indian and Northern Affairs,  
Ottawa, 1978  
QS-8157-000-EE-A1

©Minister of Supply and Services Canada 1978  
Catalogue No. R71-6/1976  
ISBN 0-662-01542-8





#### Overlay Legend

-  Gas Discovery
-  Oil Discovery
-  Oil or Gas Field
-  Outline

#### Islands

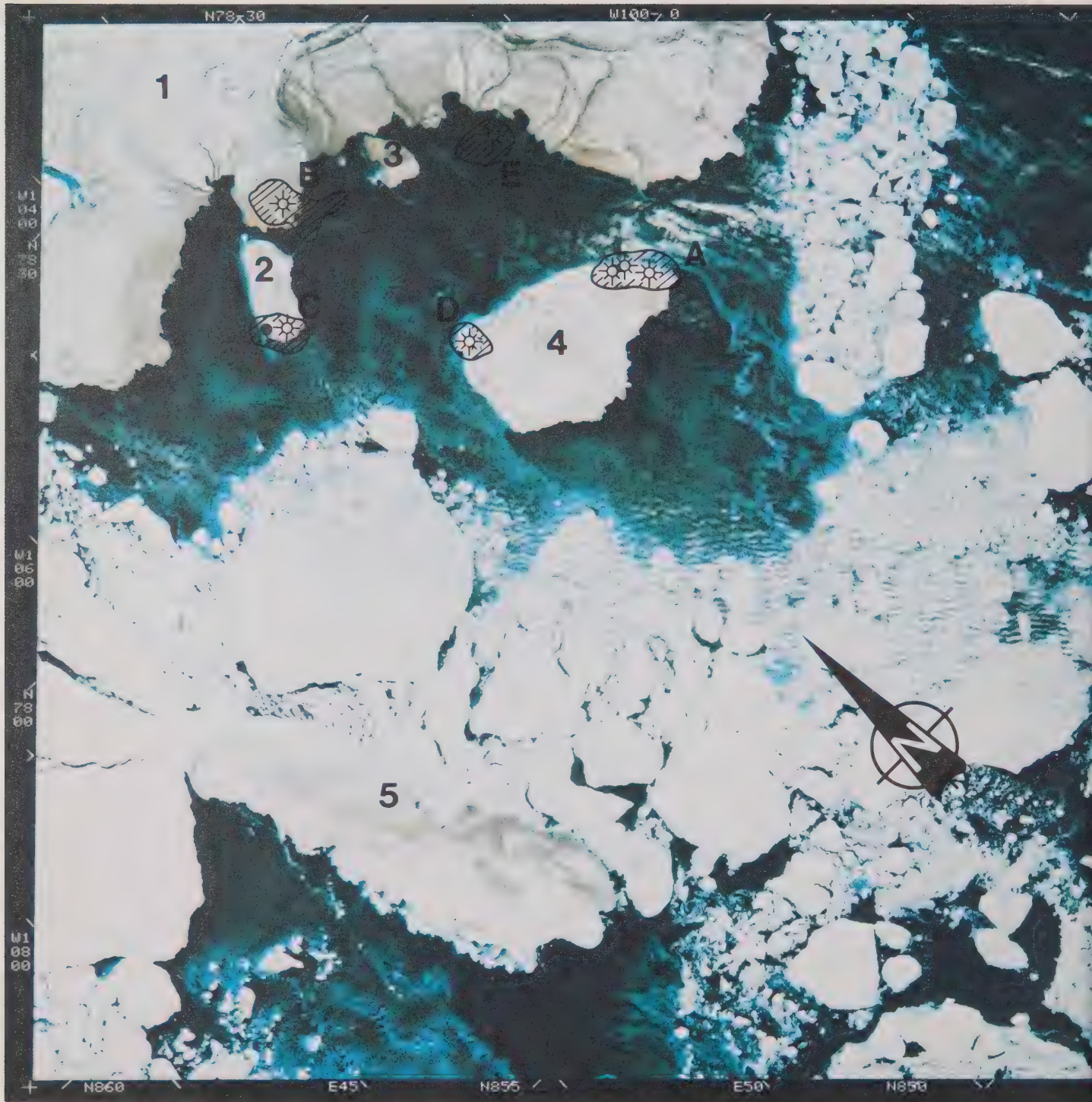
1. Ellef Ringnes
2. Thor
3. Elve
4. King Christian
5. Loughheed

#### Gas or Oil Fields

- A. King Christian Gas Field
- B. Kristoffer Bay Gas Field
- C. Thor Oil and Gas Field
- D. Wallis Gas Field
- E. Jackson Bay Gas Field

#### Note:

These field outlines are approximated from published reports.



Satellite photograph of the Maclean Strait region, Sverdrup Basin, Arctic Islands

# Table of Contents



---

7 **Introduction**

---

9 **Summary**

---

12	Oil and Gas Discoveries and Reserves
20	Land administration
25	Acts and regulations
28	Revenues
35	Drilling activities
46	Operations
47	Exploration and drilling expenditures
52	Pipelines
55	Production, Processing and Refining
56	Participation and Research Projects

---

57	<b>Appendix I</b>
	Sources for information relative to oil and gas activity North of 60

---

71	<b>Appendix II</b>
	Directives

---

72	<b>Appendix III</b>
	Reporting forms

---

74	<b>Appendix IV</b>
	Summaries of the Geological Provinces

---

75	<b>Appendix V</b>
	Selected Geological References

---





# Tables and Illustrations

## Tables

12	Table 1.	Area and volume of sediments
18	Table 2.	Canadian Petroleum Association reserves
19	Table 3.	Summary of Oil and Natural Gas Resources of Canada — 1975
20	Table 4.	Number of issued permits and leases with acreage as of December 31, 1976
32	Table 5.	Gross revenue, oil and gas (calendar year)
33	Table 6.	Gross revenue, oil and gas (fiscal year)
39	Table 7.	Wells abandoned or completed in 1976
51	Table 8.	1973-76 exploration survey statistics

## Illustrations

Oil and gas fields and discoveries (map) centrefold

11	Fig. 1.	Geological Provinces (map)
21	Fig. 2.	Area held under oil and gas permit
22	Fig. 3.	Acreage under lease — by year
23	Fig. 4.	Permit terms and work requirement zones
24	Fig. 5.	Permit terms and deposit requirements — per acre
26	Fig. 6.	Flow diagram of disposal of oil and gas rights
29	Fig. 7.	Gross revenue, oil and gas (calendar year)
30	Fig. 8.	Gross revenue, oil and gas (fiscal year)
31	Fig. 9.	Value of work bonus tenders — oil and gas
36	Fig. 10.	Wells drilled

37	Fig. 11.	Depth drilled
38	Fig. 12.	Wells completed or abandoned in 1976 — southern N.W.T. & Y.T. (map)
42	Fig. 13.	Wells completed or abandoned in 1976 — Mackenzie Delta/Beaufort Sea (map)
43	Fig. 14.	Wells completed or abandoned in 1976 — Arctic Islands (map)
48	Fig. 15.	Exploration activity — geological crew months — land seismic crew months
49	Fig. 16.	Exploration activity — seismic line miles
50	Fig. 17.	Oil and gas exploration expenditures submitted for work credits
53	Fig. 18.	Northern pipelines (map)
60	Fig. 19.	Airstrips in the Queen Elizabeth Islands
61	Fig. 20.	District boundaries

## Photographs

<i>Frontispiece</i>	Satellite photograph of the Maclean Strait region, Arctic Islands
10	Photo 1. Running-in with a new drill-bit at Imp. Arnak. ( <i>Courtesy of Imperial Oil Ltd.</i> )
34	Photo 2. Constructing the Sarpik man-made island in the shallow waters of the Beaufort Sea. ( <i>Courtesy of Imperial Oil Ltd.</i> )
34	Photo 3. Completed island, Sarpik, during drilling operations. ( <i>Courtesy of Imperial Oil Ltd.</i> )
44	Photo 4. Imp. Kugmallit H-59 in the Beaufort Sea. ( <i>Courtesy of Imperial Oil Ltd.</i> )
44	Photo 5. CanMar Explorer I drillship on location at Tingmiark in the Beaufort Sea. ( <i>Courtesy of Dome Petroleum Ltd.</i> )
47	Photo 6. Moving a drilling rig in the Sverdrup Basin. ( <i>Courtesy of Panarctic Oils Ltd.</i> )



# Introduction

This report covers oil and gas activities North of 60 for the year 1976. All aspects of these operations in the Yukon and Northwest Territories are administered by the Northern Non-Renewable Resources Branch, Department of Indian and Northern Affairs. It is the intent of the Department to provide for the orderly exploration and exploitation of oil and gas, thereby achieving local benefits to the specific areas involved as well as benefiting the people of Canada in general through the revenues accruing to the Crown.

As of March 1, 1977 the Minister and departmental officers responsible for the administration of oil and gas resources in the Northwest Territories, Yukon Territory and the northern offshore areas were:

Minister — The Honourable Warren Allmand  
Deputy Minister — Arthur Kroeger  
Assistant Deputy Minister (Northern Affairs) — E.M.R. Cotterill  
Director, Northern Non-Renewable Resources Branch — Dr. H.W. Woodward

## Oil and Gas Lands Division

Chief — P. Sullivan  
Head, Oil and Gas Rights Section — J.A.S. Barrett  
Head, Production and Royalty Section — R.J. Marshall

## Oil and Gas Resource Evaluation Division

Chief — Dr. J. Hea  
Head, Oil and Gas Exploratory Operations Section — S.A. Kanik  
Head, Oil and Gas Resource Evaluation Section — Appointment pending

## Oil and Gas Engineering Division

Chief — Appointment pending  
Head, Drilling and Completion Engineering Section — M.K. El-Defrawy  
Head, Offshore Petroleum Engineering Section — L.J. Franklin  
Head, Production Systems Engineering Section — R.L. Price  
Head, Reservoir Engineering Section — T.M. Baker  
Head, Pipelines Engineering Section — R.E. Jackson  
Scientific Research and Special Projects Co-ordinator — I.M. Feldman  
Regional Oil and Gas Conservation Engineer, N.W.T. (Yellowknife) — M.D. Thomas  
Regional Oil and Gas Conservation Engineer, Y.T. (Whitehorse) — A.F. Halcrow  
District Oil and Gas Conservation Engineer

- for Arctic Islands, District 1, N.W.T., (in Yellowknife) — B.N. Berry
- for Southern Sector, N.W.T., District 2, N.W.T., (in Yellowknife) — appointment pending
- for Northern Sector, N.W.T., District 3, (in Inuvik) — D.R. Whitehead





# Summary

All oil and gas operations in Canada North of 60 come under the administration of the Northern Non-Renewable Resources Branch and the Northern Operations Branch of the Department of Indian and Northern Affairs.

Exploration for hydrocarbons continued throughout the Arctic in 1976 with discoveries of oil and gas being made at Cameron Island in the Queen Elizabeth Archipelago and at two wells in the Mackenzie Delta. Gas was discovered at a number of new sites in the Delta and in the Archipelago, on Melville Island and at Jackson Bay off Ellef Ringnes Island. With so much of this vast area still to be explored for resources, no definite estimate of hydrocarbon reserves there can be made at present. However, 1976 totals indicate that for Canada as a whole as well as for the area North of 60, estimates of *proved* and *probable* oil reserves showed a decline. Reserves of natural gas increased, both in the north and in the country as a whole; reserves of natural gas liquid (condensate) declined for the country as a whole but increased by more than 11,700,000 bbls. in the Yukon and the Northwest Territories.

During the year, the oil that continues to be produced from the Norman Wells field was refined and consumed locally. Rate of production in 1976 averaged 2,751 bbl. per day, down slightly from the 1975 figure. Gas is produced in commercial quantities at the Pointed Mountain and Beaver River fields and is processed at the Clarke Lake plant at Fort Nelson, B.C.

The new *Petroleum and Natural Gas Act*, to be introduced into the Commons during the 1976-77 session, is expected to become law early in 1978 at which time the accompanying Regulations will also be promulgated. While this Act is being prepared, minimal disposals of oil and gas rights are being made, however applications for leases now on file still cover almost 9 million acres. Holdings progressing through the discretionary renewal periods total about 26 million acres, indicating that interest in northern exploration continues high.

Drilling and Production Regulations complementary to the *Canada Oil and Gas Production and Conservation Act* are expected to be promulgated in 1978 after comments and recommendations from Industry have been duly considered.

For all areas, North of 60, permits must now be obtained under the amended *Territorial Land Use Regulations*, for all operations that might create any significant environmental impact.

As of January 1, 1979, conversion to metric will be required of all aspects and activities of the Industry. To facilitate these changes, a training course for personnel involved has been prepared and initiated under the auspices of the Canadian Petroleum Association.

Although there was no sale of oil and gas rights in 1976, revenues from northern operations, nevertheless, increased slightly over those of 1975 due to an increase in royalties collected. On the other hand, rental income declined.

Drilling operations in 1976 were carried on in four areas: Mackenzie Delta—Tuktoyaktuk Peninsula, Mackenzie Bay, Beaufort Sea and the Arctic Islands — notably in the Sverdrup Basin. Approximately 70 percent of this work was exploratory with nine development wells being drilled, eight of which were suspended.

Offshore drilling from man-made ice islands, continued in the Archipelago by Panarctic Oils Limited, included the first two exploratory wells ever to be drilled from such a platform. One of these wells resulted in the gas discovery at Jackson Bay. Panarctic has requested permission to drill five more ice-island wells in 1977. In the Beaufort Sea, Imperial Oil constructed five new man-made islands and applied for permission to build two more in 1977; Sun Oil Company began drilling its second well from a man-made island created from bottom sediments; Dome Petroleum Limited began its probe for oil and gas employing a fleet of three drillships and auxiliary barges and tugs, all of which wintered over in the Arctic. Of the three wells drilled, only one so far, indicated a hydrocarbon pool (gas), but lateness of the season forced suspension before any estimate of potential could be made. Canadian Marine Drilling Limited, a subsidiary of Dome, has ordered a 5-ton catamaran equipped to deal with any oil contamination in Arctic waters that might result from these offshore drilling operations.

Geological survey work increased in 1976 but seismic surveys were down by about 9 percent from 1975 and were almost entirely limited to the

Mackenzie Delta, the Arctic Islands and the inter-island areas where land techniques were used on the ice. This 1976 reduction in seismic activity would seem to forecast a reduction in drilling activity in 1977. Marine seismic operations were carried out in Lancaster Sound, certain inter-island areas and in the Beaufort Sea.

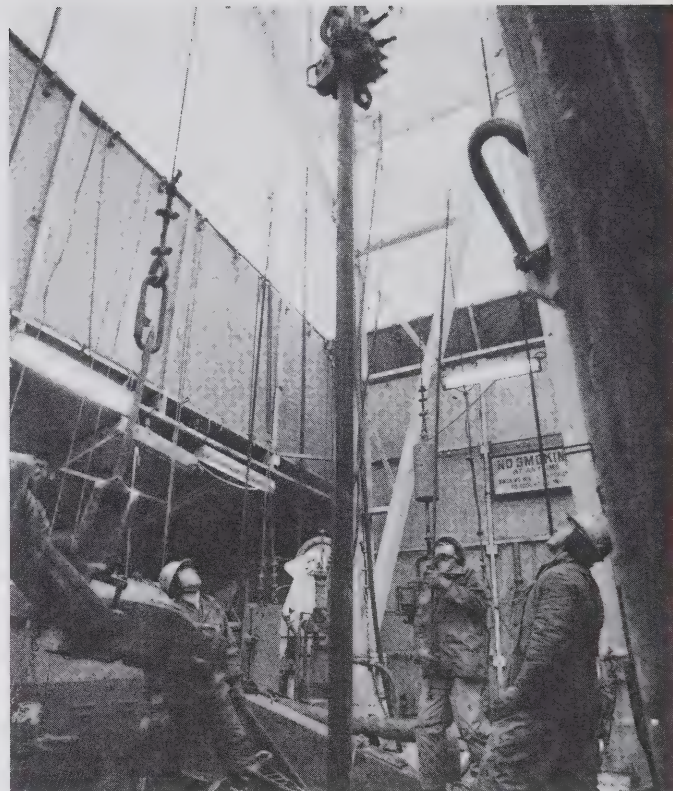
Exploration in the Archipelago is expected to intensify as a result of a six-company agreement to undertake an \$80 million joint seismic/drilling program over an area of several million acres in the next four years. Most of this area is located offshore and drilling will be done from ice islands where necessary.

As a further aid to future northern operations, a new Polar 7 Class icebreaker, already tested in scale model, is being designed, and a study contract has been awarded for modifications of one of the turbine engine units being considered for this vessel. There is, as yet, no indication when the ship will be built.

Because of Dome's \$100 million expenditure in the Arctic in 1976, total expenditure by the Industry for the year exceeded \$350 million, about the same amount as in 1975. Field expenditures increased by about \$20 million over the previous year, expenditures for exploratory and development drilling were up \$10 million as were also total geophysical and geological expenditures. Assuming that the issuance of permits and leases is resumed and that offshore drilling continues in the Beaufort Sea, a very considerable increase in expenditure by Industry is expected in 1978.

Applications to build a Mackenzie Valley gas pipeline were filed in 1975 by Canadian Arctic Gas Pipeline Ltd., and by Foothills Pipe Lines Ltd. In 1976, the Foothills Pipe Lines Ltd. group applied in both the United States and Canada for permission to construct a pipeline to transport Alaska North slope gas through Alaska and the Yukon for ultimate delivery, via extension of existing Canadian systems, to American markets. This is known as the Alcan Route.

The Polar Gas Group continued its research into all aspects of engineering, geography, ecology, and costing of a gas pipeline from the Arctic Islands. Three routes are under consideration.



Running-in with a new drill-bit at Imp. Arnak.

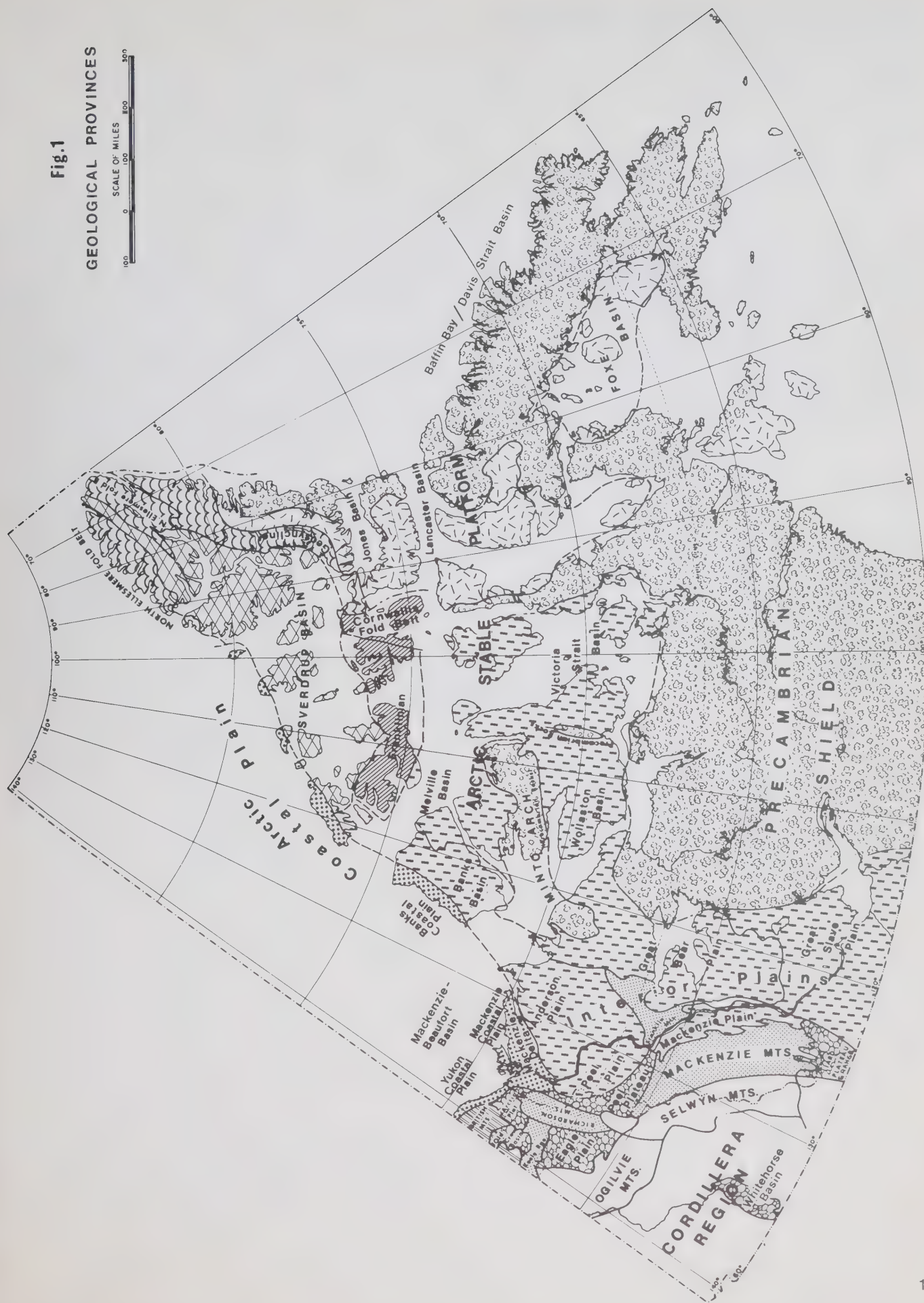
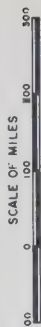
At present, the only production and refining of oil North of 60 is at Norman Wells. The only commercial production of natural gas comes from the Pointed Mountain and Beaver River fields: this gas is processed at the Clarke Lake plant. However, three of the major oil companies have applied for approval to develop Mackenzie Delta gas reserves and to build three gas processing plants coincidentally with the construction of a Mackenzie Valley gas pipeline. Engineering design and assessment of these plants is underway at present.

During 1976, the Arctic Petroleum Operators Association (APOA) continued involvement in northern environmental and engineering research with 12 new projects being initiated and support being given to projects carried out by Canadian universities. In addition, extensive geophysical and geological surveys, feasibility studies, environmental assessments, bottom sampling studies, and research into ice defence systems were carried out by a number of the major oil, engineering and survey companies.



Fig.1

# GEOLOGICAL PROVINCES



# Oil and Gas Discoveries and Reserves

In Canada, the area North of 60 covers roughly 3,800,000 square kilometres of which nearly one-third, about 1,204,000 square kilometres, are underlain by sedimentary rocks.

A comparison of the area and volume of sediments in the Western Provinces, the Yukon and the Northwest Territories (including the Arctic Islands) is given in Table 1.

**Table 1 — Area and Volume of Sediments**

Region	Total area (sq. miles)	Volume of sediments (cu. miles)	Total area (sq. kilometres)	Volume of sediments (cu. kilometres)
Manitoba and Saskatchewan	220,000	165,000	570,000	688,000
Alberta	224,700	333,400	582,000	1,390,000
British Columbia	138,500	298,000	359,000	1,242,000
Yukon and Northwest Territories				
Mainland	541,500	421,000	1,402,000	1,755,000
Arctic Archipelago	644,600	1,275,000	1,670,000	5,314,000
	1,769,300	2,492,400	4,582,000	10,389,000

For convenient reference, the area has been divided into thirteen major geological "provinces" and a number of "sub-provinces" as shown in Figure 1. A short list of relevant references to the geology of the area is given in Appendix V. More details of these geological provinces are given in Appendix IV Geological Summaries. The recoveries map shows the location of all oil and gas fields, including the 1976 discoveries.

The distribution of oil and gas discoveries and recoveries, and the potential for future discoveries in the various geological provinces is outlined below. An asterisk to the left of the well name indicates discovery or recovery of hydrocarbons in 1976.

Geological Provinces North of 60 and the Oil and Gas discoveries there to end of 1976 (\*indicate discovery/recovery in 1976)

1. Arctic Stable Platform — only four wells have been drilled to date, all unsuccessful.
2. Franklinian Geosyncline — significant quantities of light gravity crude oil have been recovered from Middle Devonian carbonates on Cameron Island.

Well name	Location	Well status	Reserve status	Horizon	Lithology	Spud date	Completion date	Potential
<b>Cameron Island</b>								
Panarctic et al Bent Horn N-72	N-72-76-30-103-30	Potential Oil & Gas Well	Oil Show	Blue Fiord	Carbonate	24-11-73	06-04-74	500 BOPD on test
Panarctic et al Bent Horn F-72A	F-72-76-30-103-30	Potential Oil & Gas Well	Oil Show	—	—	21-05-75	19-12-75	—
*Panarctic et al Bent Horn A-02	A-02-76-30-104-00	Potential Oil & Gas Well	Oil Discovery	—	—	06-05-76	01-08-76	—

3. Sverdrup Basin — seven gas fields have been discovered to date. Recoveries of crude oil have been recorded from Ellesmere and Thord Islands.

#### Gas Discoveries

##### Melville Island

Panarctic Drake Point N-67	N-67-76-30-108-30	Abandoned	Gas Discovery	Jurassic	Sandstone	14-04-69	02-09-69	Abandoned after blowout
Panarctic Drake Point L-67	L-67-76-30-108-30	Potential Dual Gas	Gas Dev.	Jurassic Bjorne	Sandstone	28-09-69	26-02-70	DST 10 MMCF (Jurassic)
Panarctic et al Drake F-16	F-16-76-30-108-30	Potential Gas	Gas. Dev.	Jurassic	Sandstone	10-05-72	16-06-72	AOF 265 MMCFD
Panarctic et al Drake B-44	B-44-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	23-09-72	22-10-72	DST 5.5 MMVFD
Panarctic et al Drake D-68	D-68-76-30-108-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	07-06-73	25-03-74	DST 8.7 MMCFD
				Bjorne	Sandstone			DST 40.1 MCFD
Panarctic et al Drake E-78	E-78-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	02-05-74	27-05-74	DST 4.8 MMCFD
Panarctic et al Drake D-73	D-73-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	23-04-75	10-05-75	DST 8.1 MMCFD
Panarctic et al East Drake I-55	I-55-76-30-107-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	06-03-75	16-04-75	AOF 58 MMCFD critical flow prover
Panarctic et al W. Hecla N-52	N-52-76-30-110-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	05-03-74	15-04-74	AOF 52 MMCFD
Panarctic et al Hecla F-62	F-62-76-30-110-00	Potential Gas	Gas Discovery	Jurassic	Sandstone	11-11-72	12-12-72	AOF 96 MMCFD
Panarctic et al Hecla I-69	I-69-76-20-110-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	22-02-73	11-04-73	DST 7.8 MMCFD
Panarctic et al E. Hecla C-32	C-32-76-30-110-00	Potential Gas	Gas Discovery	—	—	07-11-75	10-12-75	—
*Panarctic et al W. Hecla P-62	P-62-76-30-110-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	07-01-76	22-02-76	DST 5.3 MMCFD
*Panarctic W. Hecla M-25	M-25-76-30-111-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	14-03-76	18-04-76	DST 5.4 MMCFD

##### Thor Island

Panarctic et al Thor H-28	H-28-78-10-103-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	28-02-73	10-05-73	Flow test to 55 MMCFD
---------------------------	-------------------	---------------	----------	---------	-----------	----------	----------	-----------------------

##### Ellef Ringnes Island

Panarctic et al Kristoffer Bay B-06	B-06-78-20-102-30	Potential Gas	Gas Discovery	Heiberg	Sandstone	09-11-71	17-03-72	DST 10 MMCFD
*Panarctic et al Jackson Bay G-16A	G-16-78-10-101-00	Potential Gas	Gas Discovery	—	—	16-03-76	30-04-76	—



**King Christian Island**

Panarctic King Christian D-18	D-18-77-50-101-00	Abandoned	Gas Discovery	Heiberg	Sand-stone	14-10-70	25-01-71	Abandoned after blowout
Panarctic King Christian D-18A	D-18-77-50-101-00	Potential Gas	Gas Dev.	Heiberg	Sand-stone	26-11-70	15-03-71	AOF 264 MMCFD
Panarctic et al King Christian N-06	N-06-77-50-101-00	Potential Gas	Gas Dev.	Heiberg	Sand-stone	13-05-71	20-09-71	AOF 340 MMCFD
Dome Arctic Ventures Wallis K-62	K-62-78-00-102-00	Potential Gas	Gas Discovery	Heiberg	Sand-stone	27-11-72	21-02-73	DST 12.43 MMCFD

**Crude Oil Recoveries****Ellesmere Is.**

Panarctic Romulus C-42	C-42-80-00-84-00	Suspended	Oil & Gas Show	Jurassic Schei Point Bjorne	Sand-stone	29-01-72	25-07-72	Area has potential
------------------------	------------------	-----------	----------------	-----------------------------	------------	----------	----------	--------------------

**Thor Island**

Panarctic et al Thor P-38	P-38-78-10-103-00	Suspended	Oil Show	Heiberg	Sand-stone	06-04-72	10-05-72	Thin Oil leg on water
---------------------------	-------------------	-----------	----------	---------	------------	----------	----------	-----------------------

4. Arctic Coastal Plain — no successful wells to date

5. Banks Basin — no hydrocarbon discoveries to date, but the area is considered to have a high potential for hydrocarbon accumulation.

6. Baffin Bay/Davis Strait — this “province” lies entirely offshore and to date has been explored by regional geophysical surveys. It contains several areas that hold promise for future hydrocarbon discoveries: the Thule Basin off Greenland, Lancaster Delta, Home Bay Delta, Cumberland Delta, Lancaster Sound and Jones Sound.

7. Mackenzie/Beaufort Basin — oil and gas have been found in Paleozoic carbonates and in Lower Cretaceous and Tertiary sands. All these finds are in the Mackenzie Delta section, Adgo and Netserk being offshore.

**Crude Oil Discoveries****Mackenzie Delta-Tuktoyaktuk Peninsula**

IOE Atkinson H-25	H-25-69-50-131-45	Abandoned	Potential Oil Well	Lower Cretaceous	Sand	14-12-69	26-02-70	3150 BOPD calc. 24.3° API
IOE Mayogiak J-17	J-17-69-30-132-45	Abandoned	Potential Oil Well	Devonian & Lower Cretaceous	Carbonate & Sand-stone	03-04-71	06-08-71	7320 BOPD 33.6° API
Imp. Ivik J-26	J-26-69-40-134-15	Suspended	Potential Oil & Gas Well	Tertiary	Sand-stone	08-04-72	30-09-72	5345 BOPD calc. 24° API
Imp. Ivik K-54	K-54-69-40-134-15	Abandoned	Potential Oil	Tertiary	Sand-stone	30-03-73	08-06-73	829 BOPD calc. 24° API
Imp. Adgo F-28	F-28-69-30-135-45	Plugged & Abandoned	Gas & Oil	Tertiary	Sand-stone	28-12-73	19-03-74	1500 BOPD 17.5° API
Shell Kugpik O-13	O-13-69-00-135-15	Suspended	Oil	Lower Cretaceous	Sand-stone	26-03-73	30-09-73	2900 BOPD 50° API
Shell Kumak J-06	J-06-69-20-135-00	Suspended	Oil	Tertiary	Sand-stone	24-11-73	01-05-74	5000 BOPD 27.1° & 31.3° API
Shell Niglintgak M-19	M-19-69-20-135-15	Suspended	Oil & Gas	Tertiary	Sand-stone	01-06-74	25-01-75	O.T.S. 18.8 32° API
*Sun et al Garry P-04	P-04-69-30-135-30	Suspended	Oil & Gas	—	—	25-08-75	05-01-76	—
*Gulf Mobil Kamik D-48	D-48-69-00-133-15	Suspended	Oil & Gas	—	—	23-12-75	04-04-76	—

**Gas Discoveries**

Gulf Mobil Parsons F-09	F-09-69-00-133-30	Suspended	Gas & Condensate	Lower Cretaceous	Sand-stone	20-01-71	19-04-72	17.2 MMCFD DST
Gulf Mobil Parsons N-10	N-10-69-00-133-30	Suspended	Gas	Lower Cretaceous & Jurassic	Sand	14-02-73	29-05-73	FT 34 MMCFD
Gulf Mobil Parsons A-44	A-44-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sand	09-04-75	22-07-75	15 MMCFD DST

Gulf Mobil Parsons P-53	P-53-69- 00-133-30	Suspended	Gas & Con- densate	Lower Cretaceous	Sand	22-12-73	09-04-74	8.3 MMCFD DST
Gulf Mobil Parsons O-27	O-27-69- 00-133-30	Suspended	Gas	Cretaceous	Sand	23-03-74	30-08-74	
*Gulf Mobil Parsons L-43	L-43-69- 00-133-30	Suspended	Gas	Lower Cretaceous	Sand- stone	10-12-75	04-03-76	27.7 MMCFD DST
*Gulf Mobil Parsons N-17	N-17-69- 00-133-30	Suspended	Gas	Lower Cretaceous	Sand- stone	18-12-75	13-04-76	22.5 MMCFD DST
*Gulf Mobil Parsons D-20	D-20-69- 00-133-30	Suspended	Gas	Lower Cretaceous	Sand- stone	21-04-76	22-11-76	20.5 MMCFD DST
Gulf Imp. Shell Reindeer F-36	F-36-69- 10-134-30	Suspended	Gas	Tertiary	Sand- stone	13-03-73	05-06-73	4.87 MMCFD DST
*Gulf Mobil Siku C-11	C-11-69-10 133-30	Suspended	Gas	Lower Cretaceous	Sand- stone	26-12-75	22-03-76	31 MMCFD Calc.
*Gulf Mobil Siku A-12	A-12-69- 10-133-30	Suspended	Gas	Lower Cretaceous	Sand- stone	14-04-76	26-07-76	47 MMCFD (est) DST
Gulf Imp. Shell Titalik K-26	K-26-69- 10-135-00	Abandoned	Gas Well (DST)	Tertiary	Sand- stone	17-10-72	20-02-73	14.05 MMCFD DST
Gulf Mobil Ya Ya A-28	A-28-69- 20-134-30	Suspended	Gas	Tertiary	Sand- stone	28-02-74	06-07-74	11.3 MMCFD DST
Gulf Mobil Ya Ya P-53	P-53-69- 20-134-30	Suspended	Gas Well (DST)	Cretaceous	Sand- stone	08-12-72	20-03-73	8.1 MMCFD DST
IOE Taglu G-33	G-33-69- 30-134-45	Suspended	Gas Well	Tertiary	Sand- stone	13-04-71	18-08-71	28.7 MMCFD DST
IOE Taglu C-42	C-42-69- 30-134-45	Suspended	Condensate & Gas	Upper Cretaceous	Sand- stone	30-04-72	18-11-72	24.5 MMCFD Calc.
IOE Taglu W. P-03	P-03-69- 30-135-00	Suspended	Gas	Upper Cretaceous	Sand- stone	12-12-71	29-03-72	6.3 MMCFD Max. flow rate
IOE Taglu D-43	D-43-69- 30-134-45	Suspended	Gas	Upper Cretaceous	Sand- stone	23-03-73	11-09-73	AOF 30.3 MMCFD
IOE Mallik L-38	L-38-69- 30-135-00	Abandoned	Potential Gas (DST)	Tertiary	Sand- stone	24-12-71	05-04-72	8.84 MMCFD CCT. calc
*Imp Netserk F-40	F-40-69- 40-135-45	Suspended	Gas	—	—	08-11-75	09-05-76	—
Shell Kumak K-16	K-16-69- 20-135-00	Suspended	Gas Well	Tertiary	Sand- stone	23-02-75	13-07-75	11.9 MMCFD DST
Shell Niglintgak H-30	H-30-69- 20-135-15	Suspended	Gas Well (DST)	Tertiary	Sand- stone	24-10-72	07-04-73	15.9 MMCFD DST
*Shell Niglintgak B-19	B-19-69- 20-135-15	Suspended	Gas	Tertiary	Sand- stone	18-10-75	22-02-76	8.6 MMCFD DST
*Sun et al Garry P-04	P-04-69- 30-135-30	Suspended	Oil & Gas	—	—	25-08-75	05-01-76	—

## 8. Interior Plains

Great Slave Plain — gas pools have been discovered in porous dolomites and limestones of Middle Devonian age.

Briggs Rabbit Lake No. 1	O-16-61- 00-118-45	Potential Gas Well	Gas Discovery	Sulphur Point	Lime- stone	04-02-55	30-03-55	AOF 2 MMCFD(EST)
Briggs Rabbit Lake No. 2	B-07-61- 00-118-45	Potential Gas Well	Gas Devel- opment	Sulphur Point	Lime- stone	09-02-57	14-03-57	AOF 6 MMCFD (EST)
Home Signal CSP Celibeta No. 2 H-78	H-78-60- 10-122-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	26-12-59	24-03-60	AOF 8 MMCFD
H.B. Cameron Hills A-05	A-05-60- 10-117-30	Potential Gas Well	Gas Discovery	Slave Point Sulphur Point	Limestone Dolomite	28-01-68	24-02-68	DST 8.2 MMCFD
H.B. Pan Am S. Island R. M-41	M-41-60- 10-121-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	03-02-64	23-04-64	DST 5.7 MMCFD
H.B. Amoco S. Island R. M-52	M-52-60- 10-121-00	Abandoned	Gas Develop- ment	Slave Point	Limestone	21-01-73	21-02-73	DST 1.3 MMCFD
Pacific Amoco Tathlina N-18	N-18-60- 20-118-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	28-01-73	19-02-73	DST 1.8 MMCFD
Shell H.B. Grumbler G-63	G-63-60- 20-115-45	Abandoned	Potential Gas Discovery	Slave Point	Limestone	14-02-69	16-03-69	DST 10 MMCFD
Sun Netla C-07	C-07-60- 50-122-45	Potential Gas Well	Gas Discovery	Sulphur Point	Limestone	20-01-61	05-04-61	AOF 24 MMCFD
Texaco Bovie	J-72-60-	Potential	Gas	Nahanni	Dolomite	06-01-70	18-01-70	DST 2.6

Lake J-72	10-122-45	Gas Well	Discovery					MMCFD
Union Pan Am	C-39-60-	Potential	Gas	Sulphur	Carbonate	29-01-65	15-03-65	DST 8
Trainor C-39	20-120-30	Gas Well	Discovery	Point				MMCFD

#### Great Bear Plain — no discoveries to date

Mackenzie Plain — oil is still produced at Norman Wells from the Devonian Kee Scarp formation and additional hydrocarbon shows have been encountered in the Cretaceous and Silurian age formations of this “province”.

#### Crude Oil Discoveries

##### Norman Wells Oil Field

Northwest	P-37-65-	Abandoned	Oil	Devonian	Fractured	14-04-20	1923	12 bbl/day
Discovery No. 1	20-126-45		Discovery	Canol	Shale			
Northwest	P-37-65-	Abandoned	Oil	Kee Scarp	Limestone	07-24	08-24	75 bbl/day
Discovery No. 2	20-126-45		Discovery	(Givetian)				

74 additional wells were drilled to develop field

**Peel Plain** — no discoveries here as yet, but hydrocarbon shows have been encountered in Lower Devonian formations.

**Anderson Plain** — one gas discovery has been made at Tedji Lake, and several other hydrocarbon shows have been encountered.

Ashland et al	F-24-67-	Suspended	Gas	Basal	Sand-	13-02-74	31-03-74	DST 4.5
Tedji Lake F-24	50-126-45			Cambrian	stone			MMCFD

9. Liard Plateau and Range — gas is being produced in this “province” at the Beaver River (B.C. portion) and Pointed Mountain fields from dolomites of the Nahanni Formation of Middle Devonian age. The Beaver River field (Y.T. portion) produced gas from Mississippian sands. Gas has also been discovered at North Beaver River and La Biche.

#### Northwest Territories

C.P.O.G. et al	F-08-60-	Suspended	Gas	Middle	Argillaceous	25-02-71	19-03-71	DST 2.9
La Biche F-08	40-124-30		Discovery	Devonian	Limestone			MMCFD
Pan Am Pointed	G-62-60-	Gas Well	Gas Devel-	Middle	Dolomite	09-07-68	23-06-69	Flow back
Mountain G-62	30-123-45		opment	Devonian				12 MMCFD
				Carbonate				
Pan Am Pointed	K-45-60-	Gas Well	Gas Devel-	Middle	Dolomite	15-09-67	08-05-68	AOF
Mountain K-45	30-123-45		opment	Devonian				75.6 MMCFD
				Carbonate				
Pan Am Pointed	O-46-60-	Gas Well	Gas Devel-	Devonian	Dolomite	29-03-69	02-10-71	AOF
Mountain O-46	30-123-45		opment	Nahanni			Extended	19.43
							Standby	MMCFD
Pan Am Pointed	P-53-60-	Gas Well	Gas	Devonian	Dolomite	06-02-66	22-02-67	AOF 70.22
Mountain P-53	30-123-45		Discovery	Nahanni				MMCFD
Amoco B-2	F-38-60-	Gas Well	Gas Devel-	Devonian	Dolomite	22-08-72	07-10-73	AOF 29
Pointed Mountain	30-123-45		opment	Nahanni				MMCFD
F-38								
Amoco Pointed	A-55-60-	Gas Well	Gas Devel-	Devonian	Dolomite	01-03-74	08-08-74	Production
Mountain A-55	30-123-45		opment	Nahanni				tested 4.5
								MMCFD

#### Yukon Territory

Canada Southern	I-27-60-	Suspended	Extension	Middle	Carbonate	24-03-63	29-09-64	AOF 1.5
et al North	10-124-00		Test Gas	Devonian				MMCFD
Beaver YT I-27			Well					
Pan Am Beaver	G-01-60-	Gas Well	Gas	Mississippian	Sandstone	12-06-68	10-03-69	AOF 6.77
River YT G-01	10-124-15		Producer	& Nahanni	& Carbonate			MMCFD AOF
								39.54 MMCFD

10. Eagle Plain — significant hydrocarbon shows have been encountered, but no commercially interesting discoveries have been reported.

Canoe River	J-19-66-	Potential	Gas & Oil	Carboniferous	Conglo-	14-12-67	17-02-68	DST 6.52
Chance YT J-19	10-137-30	Gas & Oil	Discovery	Hart River	meratic			MMCFD
					Sandstone			
Socony Mobil	G-08-66-	Potential	Gas & Oil	Cretaceous	Sandstone	04-12-64	15-02-65	DST 3.3
WM Chance YT	10-137-30	Oil Well	Discovery	Carbo-	Conglo-			MMCFD
G-08				niferous	meratic			1180' oil
				Hart River	Sandstone			
Socony Mobil	B-34-66-	Potential	Gas	Carbon-	Conglo-	04-08-64	06-08-65	DST 7.3
WM Birch YT B-34	10-136-45	Gas Well	Discovery	iferous	meratic			MMCFD
				Hart River	Sandstone			



Socony Mobil WM Blackie YT No.1 M-59	M-59-66- 00-137-00	Potential Gas Well	Gas Discovery	Permian	Conglo- meratic Sandstone	11-12-63	27-03-64	DST 2.8 MMCFD
WM Chance YT No. 1 M-08	M-08-60- 10-137-30	Potential Gas or Oil Well	Gas & Oil Discovery	Cretaceous Carbon- iferous Hart River	Sandstone Conglo- meratic Sandstone	30-05-59	25-05-60	11/64" Choke 5 MMCFD 10.5 bbl/d

---

11. Peel Plateau — shows of hydrocarbons have been observed.

12. Old Crow Basin — no hydrocarbon discoveries have been made.

13. Whitehorse Plain — no hydrocarbon discoveries have been made.

---

# Report of the Reserves Committee

## Canadian Petroleum Association

The Reserves Committee presented its annual report on Canada's liquid hydrocarbon, natural gas and sulphur reserves as of December 31, 1976. Its estimates of *proved* and *probable* remaining reserves are shown in the tabulations below. Included in the tabulations are gas reserves for the Mackenzie Delta, which were first included in 1974, and for the Arctic Islands, first included in 1975. The Mackenzie Delta reserves are rated at 6.7 trillion cubic feet (up 1.6 TCF from 1975); the Arctic Islands reserves are rated at 9.5 trillion cubic feet (up 3.9 TCF from 1975); 0.7 trillion cubic feet are included for the southern Territories, relatively unchanged from 1975.

**Table 2 — Canadian Petroleum Association reserves**

Crude oil (thousand barrels)	Proved	Probable
<i>Remaining reserves as of Dec. 31, 1976</i>		
Yukon and Northwest Territories	38,717	68,717
Canada	6,257,082	7,431,397
<i>Net change during 1976</i>		
Yukon and Northwest Territories	-1,079	-1,079
Canada	-395,920	-401,254

Natural gas liquids (thousand barrels)		
<i>Remaining reserves as of Dec. 31, 1976</i>		
Yukon and Northwest Territories	34,616	53,544
Canada	1,546,105	1,727,444
<i>Net change during 1976</i>		
Yukon and Northwest Territories	11,760	12,432
Canada	-39,949	-24,458

Total liquid hydrocarbons (thousand barrels)		
<i>Remaining reserves as of Dec. 31, 1976</i>		
Yukon and Northwest Territories	73,333	122,261
Canada	7,803,187	9,158,841
<i>Net change during 1976</i>		
Yukon and Northwest Territories	10,681	11,353
Canada	-435,869	-425,712
Marketable Natural Gas (million cubic feet @ 14.65 psia and 60°F)		

<i>Remaining reserves as of Dec. 31, 1976</i>		
Yukon and Northwest Territories	4,825,118	16,823,660
Canada	58,281,942	76,359,832
<i>Net change during 1976</i>		
Yukon and Northwest Territories	1,178,438	5,156,438
Canada	1,307,226	4,893,059

# Summary of Oil and Natural Gas Resources of Canada

**Table 3** — Summary of oil and natural gas resources of Canada — 1975\*  
(Remaining reserves, discovered resources and undiscovered potential)

Region	<i>Likelihood of Existence</i>		
	"High"	"50/50 chance"	"Low"
	90% probability	50% probability	10% probability
<i>Oil resources</i> (billions of barrels)			
Atlantic Shelf South .....	1.2	1.9	3.0
Labrador-East			
Newfoundland Shelf ....	1.7	2.6	4.5
Northern Stable Platform			
Basins .....	0.01	0.6	3.2
St. Lawrence Lowlands ....	0.04	0.09	0.2
Western Canada .....	10.9	11.7	13.5
Mainland Territories .....	0.3	0.5	1.0
Mackenzie Delta-Beaufort			
Sea .....	4.3	6.9	12
Sverdrup Basin .....	1.1	2.0	4.0
Arctic Fold Belts .....	0.5	1.8	4.3
Total Canada (Accessible Regions) .....	25	30	43
<i>Gas resources</i> (trillions of cubic feet)			
Atlantic Shelf South .....	8.6	13.2	20
Labrador-East			
Newfoundland Shelf ....	18	26.7	45
Northern Stable Platform			
Basins .....	0.4	2.3	12
St. Lawrence Lowlands ....	0.7	1.4	3.2
Western Canada .....	89	97	107
Mainland Territories .....	6.0	9.7	20
Mackenzie Delta-Beaufort			
Sea .....	39	60	99
Sverdrup Basin .....	21	40	80
Arctic Fold Belts .....	2.9	11	26
Total Canada (Accessible Regions) .....	229	277	378

*Note:* These columns do not total arithmetically to the Canada totals because individual curves must be summed using a statistical technique described elsewhere in the report.

The Department of Energy, Mines and Resources has estimated the likelihood of existence of oil and gas resources in the various regions of Canada. These estimates are reproduced in Table 3<sup>1</sup>.

<sup>1</sup>Extracted from "Oil and Natural Gas Resources of Canada, 1976", Report EP77-1, Department of Energy, Mines and Resources.



# Land Administration

On May 19, 1976, the Honourable Alistair Gillespie, Minister of the Department of Energy, Mines and Resources, and the Honourable Judd Buchanan, Minister of the Department of Indian and Northern Affairs announced through a Statement of Policy, the elements of a new Petroleum and Natural Gas Act to be placed before Parliament early in 1977. This Statement effectively continued the previous embargo on new disposals of oil and gas rights in the North, thus the numbers of permits and leases continue to show a decline.

The decline in permit and lease holdings amounted to about 20 per cent of the number held in the previous year. This decrease reflects both the maturing of permit holdings due to the passage of time, as well as shifts of exploratory effort away from less prospective areas. See Table 4 and Figures 2 and 3. However, continued interest, primarily in the Mackenzie Delta, Beaufort Sea and Arctic Islands areas, is expressed by increasing number of holdings being held through their full terms. These holdings are now progressing through discretionary renewal periods based on annual escalating work requirements under the Regulations. About 26 million acres fall into this category. During 1977, about 36 million permit acres will reach maturity.

While the proposals for revisions have been discussed over the past few years, the issuance of leases, from existing and expiring permits, has been suspended. At present, lease applications, received since 1972 covering almost 9 million acres, are on hand; almost 2.5 million acres being applied for during 1976. These applications are not included in the permit and lease totals in Table 4.

**Table 4 — Number of issued permits and leases - with acreage - as of December 31, 1976**

Area	No. of permits		No. of leases	
		Acreage		Acreage
N.W.T. Mainland	1,320	59,035,802	466	2,763,230
Yukon Mainland	352	15,340,199	57	242,934
Arctic Islands	3,663	173,597,956	Nil	Nil
Arctic Coast Marine	854	39,886,219	Nil	Nil
	6,189	287,860,176	523	3,006,164

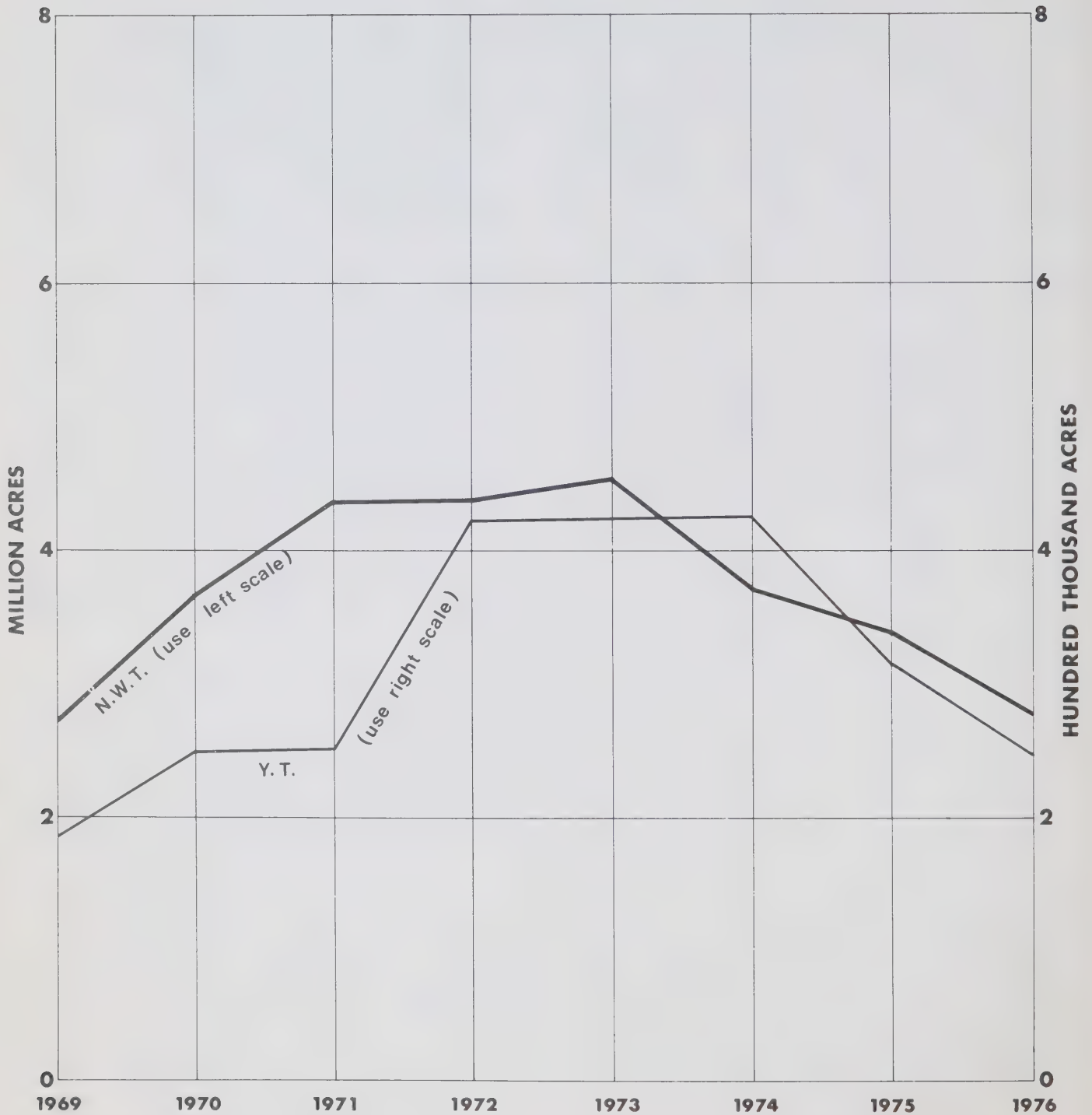
Total area under permit or lease 290,866,340 acres, down by 71,655,813 acres (19.7 per cent) from 1975.

At year end, the Department was preparing to implement a number of interim measures designed to regularize land holdings under authority of the existing Regulations but within the spirit of the policy elements announced in May. The intent of these measures is to ensure that exploratory efforts are not unduly delayed or prevented pending the enactment of the revised legislative and regulatory scheme.

Fig. 2  
**AREA HELD UNDER OIL & GAS PERMIT**  
 YUKON TERRITORY AND NORTHWEST TERRITORIES



Fig. 3  
YUKON TERRITORY - NORTHWEST TERRITORIES  
ACREAGE UNDER LEASE  
BY YEAR





Canada Lands are administered by the Department of Indian Affairs and Northern Development north of the heavy line. Offshore areas elsewhere administered by the Department of Energy, Mines and Resources

**Fig.4**

**PERMIT TERM AND WORK REQUIREMENT ZONES**

**NORTH OF 60°**

	<b>\$ 2.65/AC.</b>
	<b>\$ 2.70/AC.</b>
	<b>\$ 2.90/AC.</b>

Scale in miles  
0 100 200 300

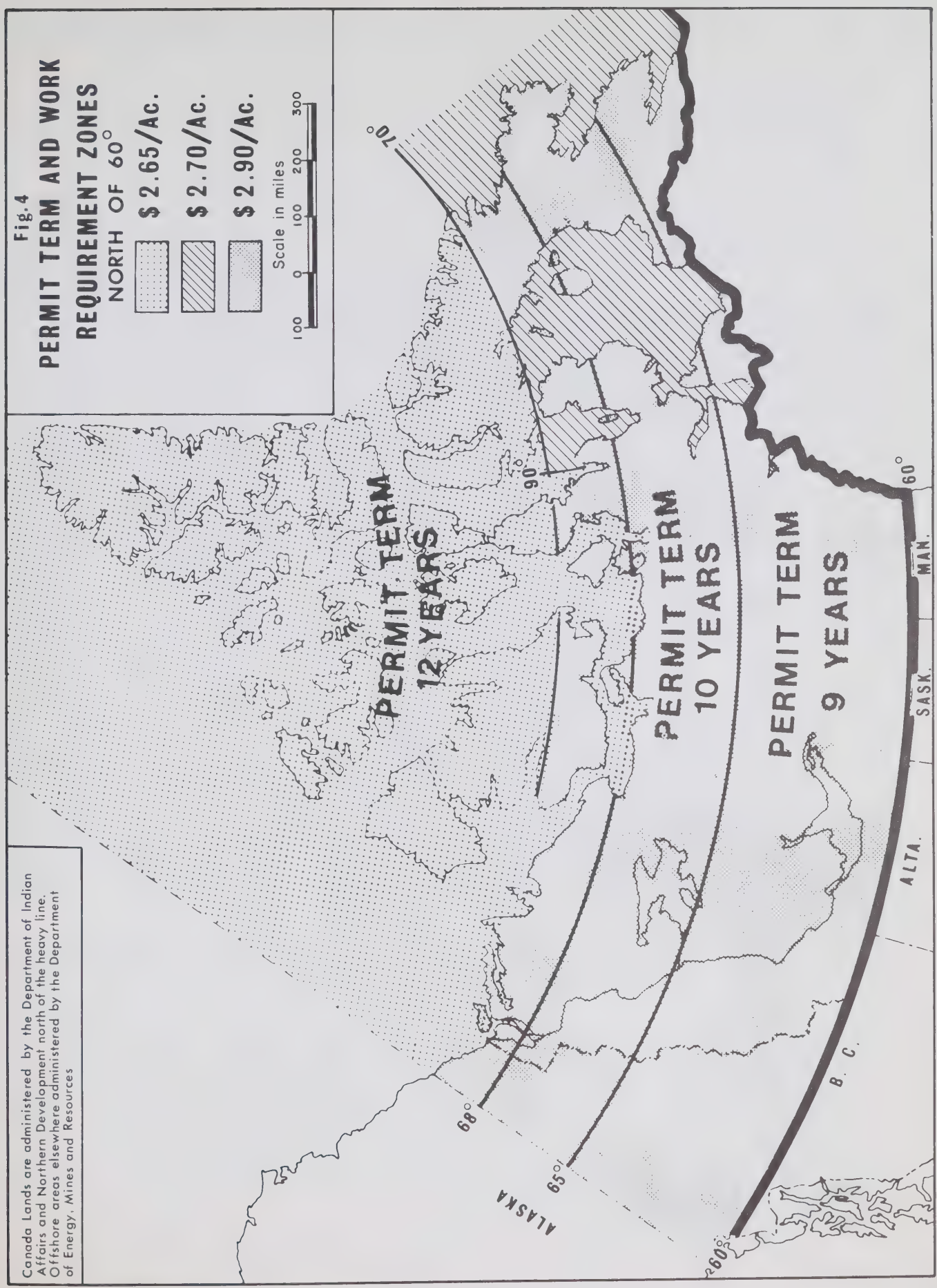
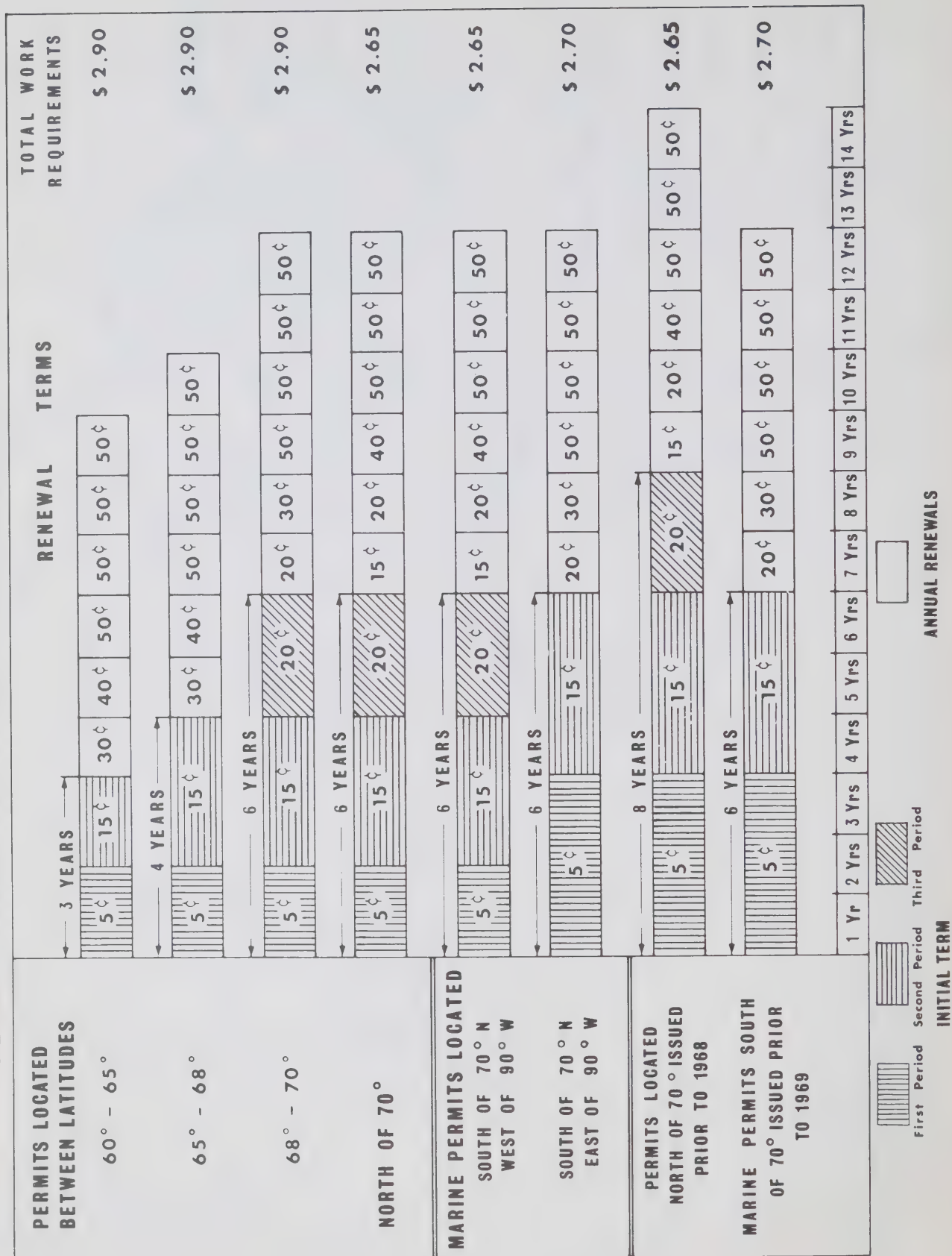


Fig. 5

YUKON TERRITORY - NORTHWEST TERRITORIES  
PERMIT TERMS AND DEPOSIT REQUIREMENTS — PER ACRE



# Act and Regulations

## **Petroleum and Natural Gas Act, new Oil and Gas Land Regulations**

On May 19, 1976, the Honourable Alistair Gillespie, Minister of Energy, Mines and Resources and the Honourable Judd Buchanan, Minister of Indian and Northern Affairs tabled before the House of Commons a Statement of Policy with respect to a Proposed *Petroleum and Natural Gas Act* and new Canada Oil and Gas Land Regulations. In accordance with the National Energy Strategy, announced in April, 1976, the new regime is designed to stimulate increased exploration in order to furnish the necessary information on which an early estimate of Canada's hydrocarbon reserves can be made. The legislative elements include fiscal and land holding incentives, combined with provisions for increased governmental control over the timing, direction, and the rate and level of exploration, development and production activities. The legislation will also provide increased benefits for and participation by Canadian firms, including Petro-Canada, engaged in development of Canada's resources. In addition, the Statement provides for the introduction of a Progressive Incremental Royalty system, supplementary to basic production royalties, in order to ensure a fair economic return to the Canadian people from resource development. The legislation continues not only the accepted principle of minimizing front end loading charges but also the unitary development concept whereby the industry is assured of rights to produce all of the hydrocarbon reserves within its development areas.

The impact of the new legislation on existing permits and leases, will be mainly to achieve an acceleration in the pace of exploratory activity. Some of its other features are: increased work obligations, shorter confidential periods for reports of exploratory projects; increased Ministerial authority to order drilling of wells and commencement of production, to post product prices, to require submission of contracts and agreements respecting transfers of interests in rights and supply contracts, to establish levels of minimum Canadian participation, and to provide preferences for Petro-Canada in the acquisition of Crown Reserves and certain existing contracts.

It is anticipated that draft legislation respecting the revised scheme will be tabled during the 1976-77 parliamentary session and that enactment, together

with promulgation of complementary regulations, will occur in early 1978.

## **Existing Oil and Gas Land Regulations**

The permit terms under the existing Canada Oil and Gas Land Regulations are summarized in Figures 4 and 5. Figure 4 shows the permit term in years, including the renewals granted additional to the initial term and the total per-acre minimum-work requirements to be met during the maximum permit life. The minimum deposit and work requirements for each period of the permit life are illustrated in Figure 5.

Land Order 1-1961 revoked in May 1970, allowed a permittee, in consideration of the payment of extra royalty, an option for 60 days to select leases for any or all of the sections of his permit which revert to the Crown after his selection of primary leases. About 100 leases granted under the Order were in good standing on December 31, 1976.

Figure 6 shows diagrammatically the flow of Canada Oil and Gas Lands under the Regulations and through the various disposal methods.

## **Canada Oil and Gas Geophysical Regulations**

A joint project was initiated by the Departments of Indian and Northern Affairs (INA) and Energy, Mines and Resources (EMR) to draft the Canada Oil and Gas Geophysical Regulations for promulgation under the *Canada Oil and Gas Production and Conservation Act*. Sections of the regulations will pertain to onshore and offshore geophysical operations on Canada Lands.

The primary intent of these regulations will be to ensure:

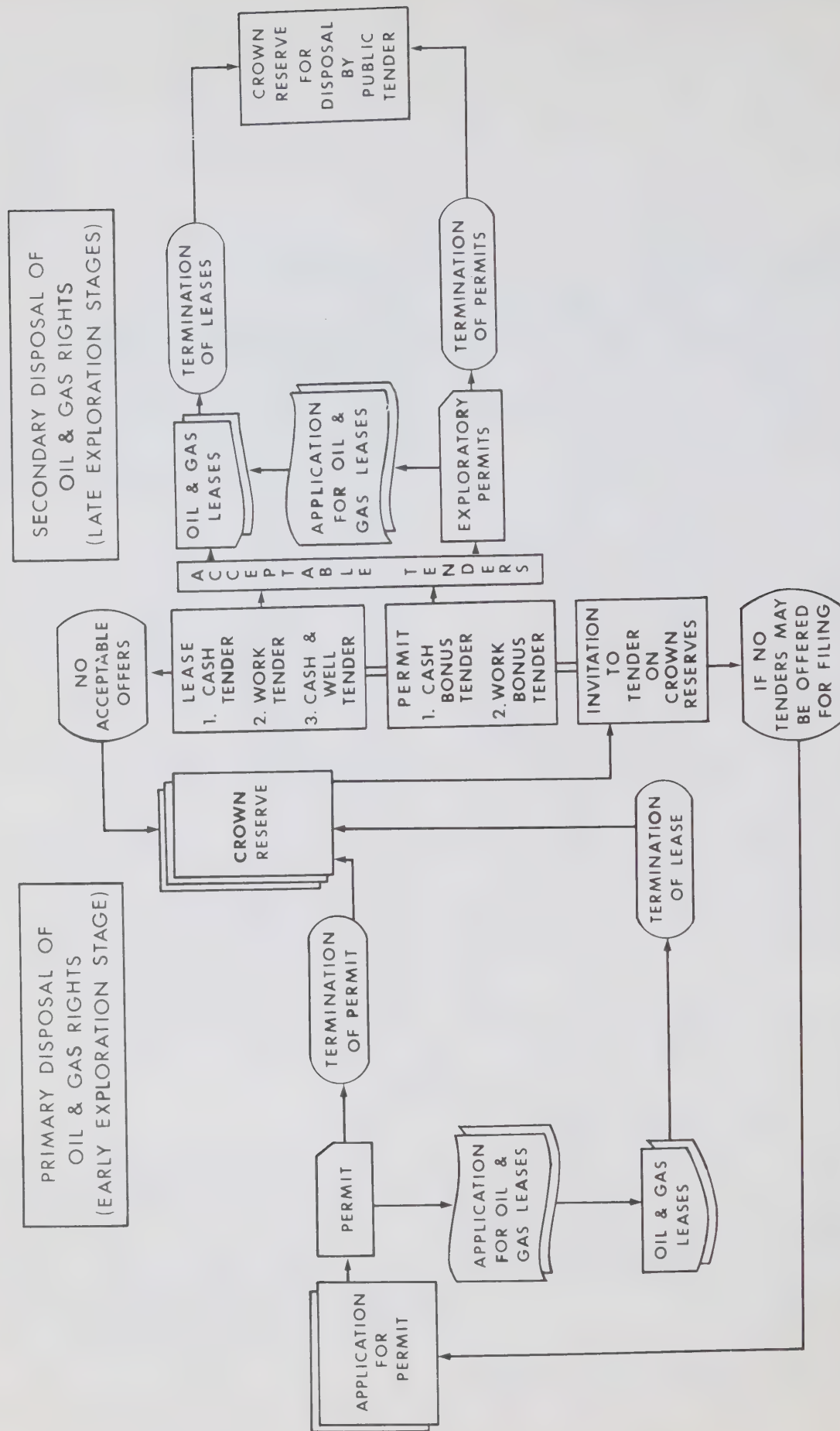
- the safety of personnel working on geophysical crews;
- the protection of the living resources of the onshore and marine areas to be surveyed;
- the quality and type of geophysical data submitted to the relevant resource organizations.

In 1976, comments were solicited and reviewed from other federal agencies and incorporated into a discussion draft. Copies of the draft will be submitted to Industry for comments.



Fig. 6

# FLOW DIAGRAM OF DISPOSAL OF OIL AND GAS RIGHTS



### **Canada Oil and Gas Drilling Regulations**

A further joint project was initiated by INA and EMR to draft the Canada Oil and Gas Drilling Regulations for promulgation under the *Canada Oil and Gas Production and Conservation Act*. Sections of the regulations pertaining to the drilling of both onshore and offshore wells were completed in draft form and reviewed with Industry during 1975 and 1976. General INA/EMR/Industry consensus has been reached and the latest revised draft is now under legal review by Privy Council. It is anticipated that the "Canada Oil and Gas Drilling Regulations" will be promulgated during 1977.

### **Canada Oil and Gas Production Regulations**

The drafting of sections of the regulations pertaining to production, pipelines, processing plants, operations and related facilities was initiated in late 1973. Sections pertaining to both onshore and offshore production were completed by INA in 1974 in draft form. The joint INA/EMR draft regulations, completed in 1975, were sent to Industry for review and comments in 1976. INA and EMR are currently reviewing Industry's comments. A joint meeting is planned for the first quarter of 1977 and on-going thereafter, as required. It is expected that consensus may be reached during 1977, with legal review late in the year and promulgation in 1978.

A set of "Offshore Structures" regulations is in draft form and being prepared for submission to Industry for comments in the first quarter of 1977. It is planned to amalgamate these with the Production Regulations at a later date.

### **Land Use Regulations**

In June, 1970, amendments to the *Territorial Lands Act* permitting the implementation of Territorial Land Use Regulations were passed by Parliament.

These Regulations were promulgated on November 4, 1971. They provide authority for designating Land Management Zones in the Yukon Territory and Northwest Territories. Within these zones most major land use operations, including resource exploration and development, require Land Use Permits. These stipulate the measures to be followed by the operator to protect the environment. Permit conditions are established on the recommendation of an interdepartmental and intergovernment Land Use Advisory Committee, following consultations with any northern community whose interests may be affected.

As a result of amendments to the Land Use Regulations, a new land-management zone was

established effective November, 1975 in order that the Land Use Permit system should apply through the Northwest Territories.

Further revised Land Use Regulations were submitted for the Minister's approval at the end of 1976. The amended Regulations will apply to both large and small land use operations to ensure that every operation which could create a significant environmental impact is controlled by permit. Equally important, sufficient time is provided to northern communities to comment fully on applications for permits which might affect their interest.

In the Northwest Territories, the Land Use Regulations are administered by the Regional Directorate, Northern Operations Branch in Yellowknife and in the Yukon Territory by the Regional Directorate of Northern Operations Branch in Whitehorse.

### **Metrication in the Oil and Gas Industry**

The Federal Government has announced its intention to introduce omnibus bills in each of the next four years to facilitate Canadian conversion to SI (Système International) measurements. The Oil and Gas Industry (in conjunction with the provincial and federal governments) put forward its plan for the metrication of all aspects of its work and this was approved by the Metric Commission on December 8, 1976. As of January 1, 1979, all transactions of the Industry at all levels — operational, business and governmental — will be required to be expressed in SI units.

Much of the operational work, drilling and construction for example, can already be easily converted but difficulties and confusion could result in dealing with business and government departments. To make personnel throughout the whole Industry thoroughly familiar with the Metric System and competent in its use, the Metrication Training Program, begun in 1976, will continue through 1977. This program, requested and financed by the Canadian Petroleum Industry, is entitled: *Metrication and SI units for the Oil and Gas Industry: a learning program for scientific and technical professionals*. It consists of books and audio tapes suitable for use by either individuals or groups.

Liaison regarding metric conversion is being maintained with the American Petroleum Institute (API) and the American National Metric Council (ANMC) and an exchange of representatives between Canada and the ANMC has been approved.

# Revenues

While no sales of oil and gas rights were held in 1976, revenues from northern operations during the calendar year approximated \$6.7 million (Table 5 and Figure 7). Revenues from all sources for the fiscal year are shown in Table 6 and Figure 8. Figure 9 shows the annual value of work bonus for oil and gas work bonus blocks and permits. The cumulative value of work bonus to the end of 1969 was approximately \$59 million. No sales have been held since then.

Total revenues for 1976 show some increase over 1975 due to the increase in royalties collected. Rental income has decreased due to the withdrawal of previous years' lease applications and the resulting refund of lease rentals totalling approximately \$1 million.



Fig. 7

**YUKON TERRITORY - NORTHWEST TERRITORIES  
CALENDAR YEAR  
GROSS REVENUE - OIL & GAS  
FROM  
CASH BONUS BIDS, FEES, FORFEITURES,  
ROYALTIES, RENTALS & SALE OF MAPS**

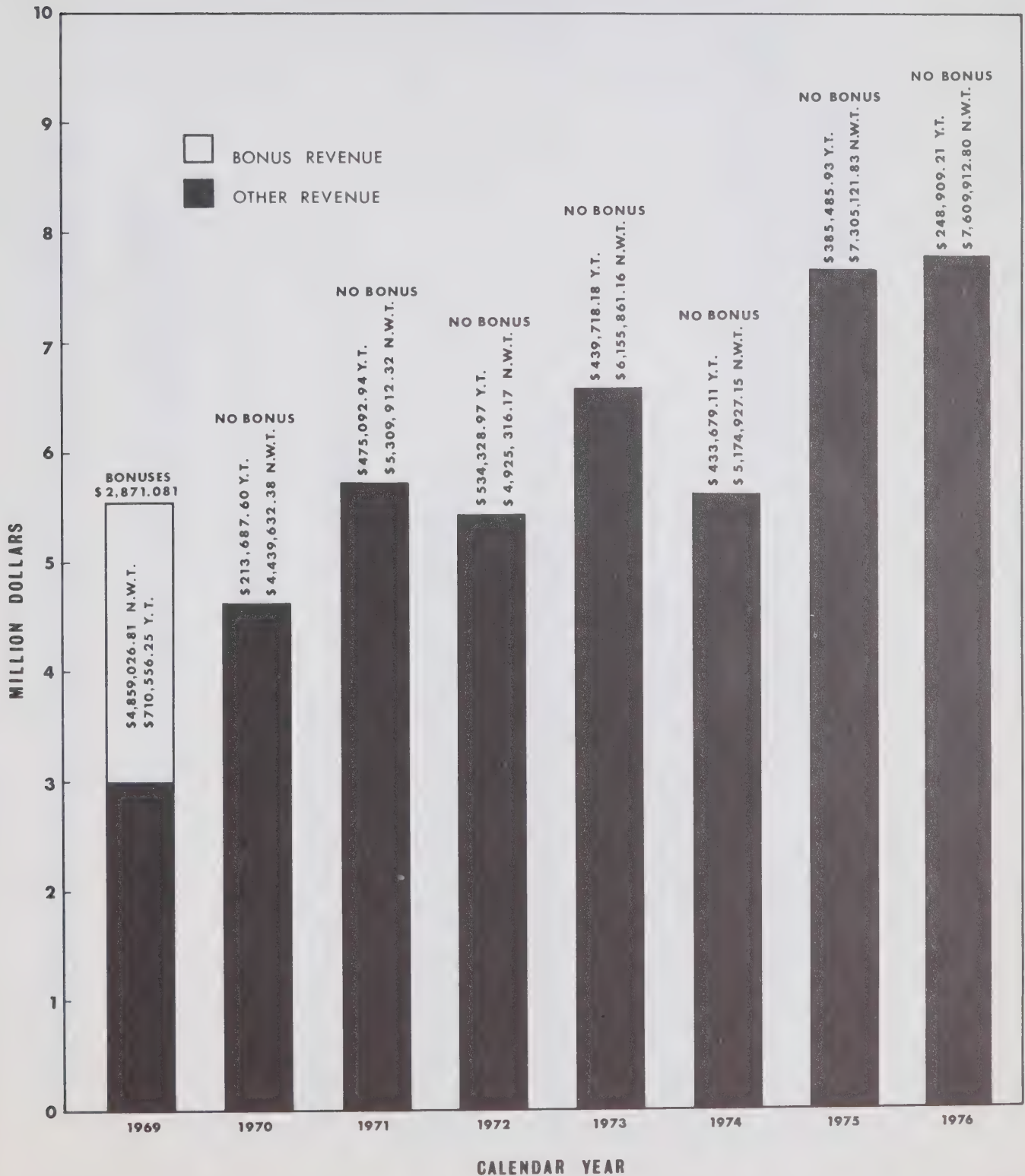


Fig. 8

YUKON TERRITORY-NORTHWEST TERRITORIES

GROSS REVENUE - OIL & GAS

FROM

CASH BONUS BIDS, FEES, FORFEITURES,  
ROYALTIES, RENTALS & SALE OF MAPS

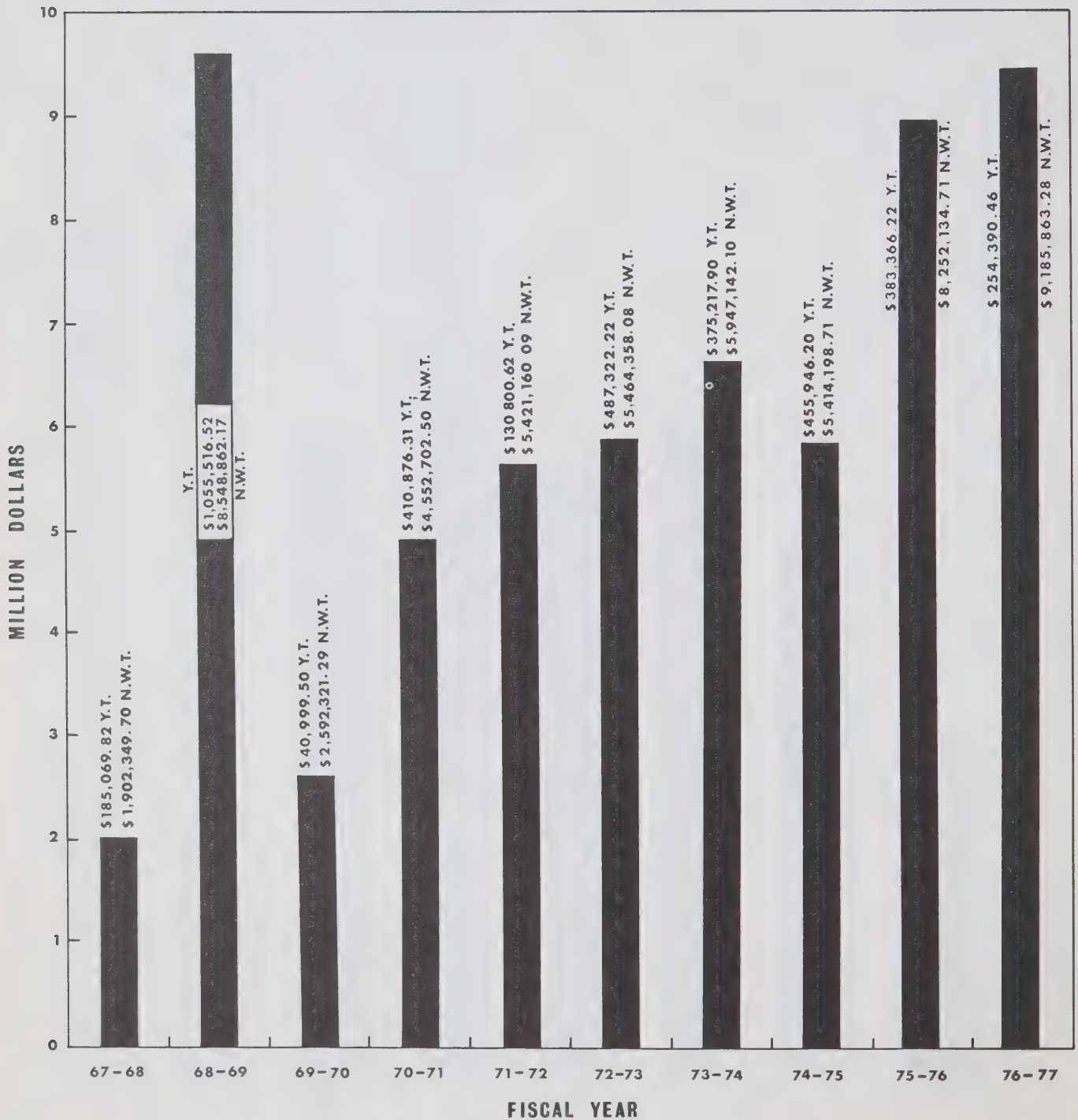


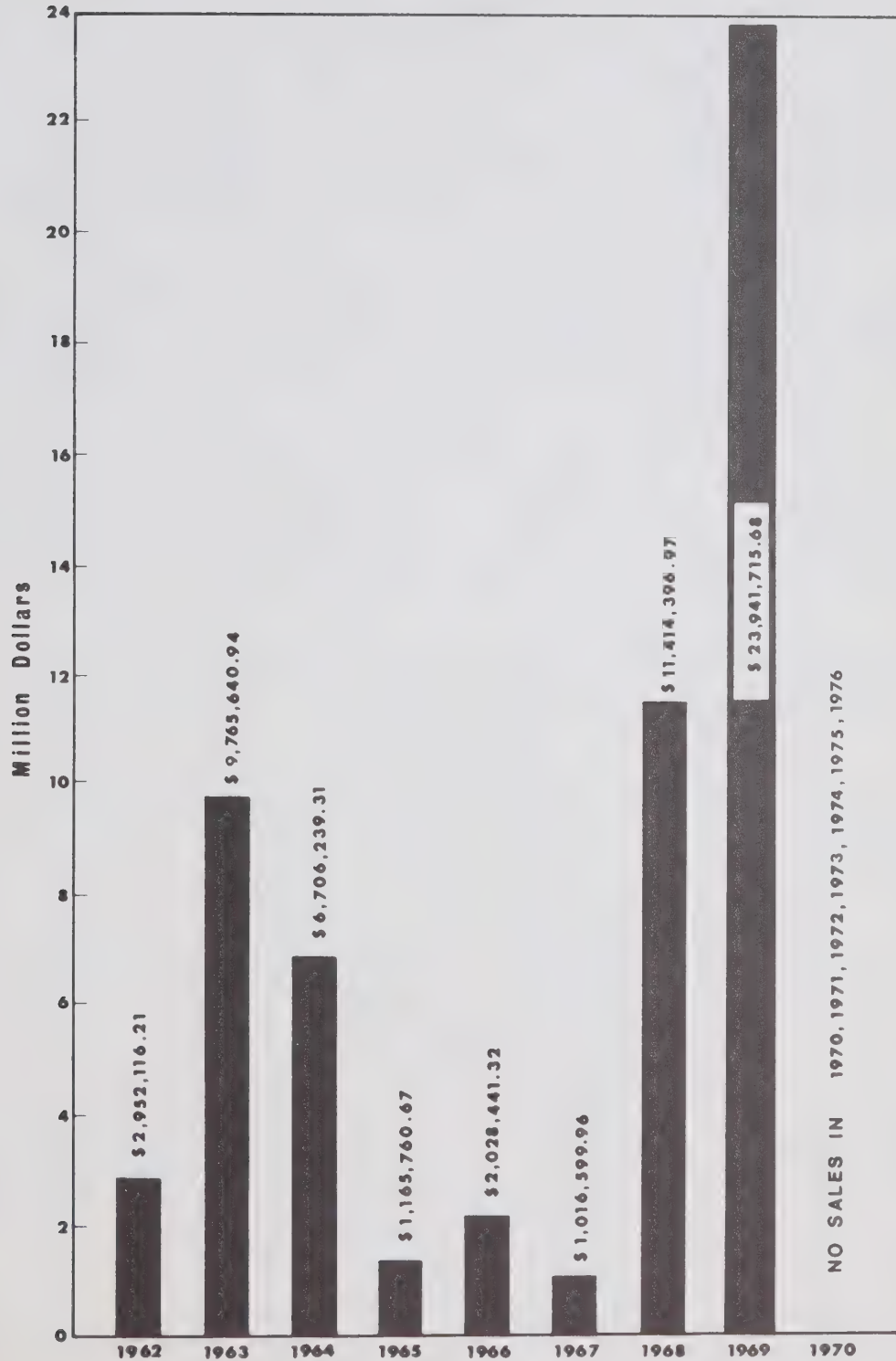
Fig. 9

# VALUE OF WORK BONUS TENDERS-OIL & GAS

## YUKON TERRITORY AND NORTHWEST TERRITORIES

NOTE: Cumulative Value End of Dec.1969

\$ 58,990,911.06





**Table 5 — Gross revenue, oil and gas (calendar year) 1970 to 1976**  
**Northwest Territories**

Year	Licence fee	Permit fee	Transfer fee	Lease fee	Rentals	Royalties	Forfeiture	Cash bonus	Misc.	Total
1970	\$ 5,175.00	\$ 141,250.00	\$ 56,350.00	\$ 1,900.00	\$ 3,315,524.09	\$ 255,259.00	\$ 661,828.60	—	\$ 2,285.69	\$ 4,439,632.38
1971	4,900.00	395,500.00	55,806.52	1,130.00	4,070,722.82(1)	301,562.00	478,609.95	—	1,681.03	5,309,912.32
1972	4,525.00	231,500.00	37,795.00	3,150.00	4,136,291.41(2)	259,276.21	251,701.28	—	1,077.27	4,925,316.17
1973	4,100.00	183,500.00	30,235.00	1,950.00	4,836,714.92(3)	734,962.91	359,957.30	—	4,441.03	6,155,861.16
1974	3,625.00	73,220.00	44,900.00	4,140.00	3,812,555.16(4)	1,186,071.90	47,550.09	—	2,865.00	5,174,927.15
1975	2,750.00	4,000.00	10,005.00	3,970.00	3,684,559.54(5)	3,425,965.83(6)	172,517.93	—	1,353.53	7,305,121.83
1976	2,425.00	—	14,635.00	4,670.00	2,675,065.79(7)	4,688,996.80	219,104.63	—	5,015.75	7,609,912.80
Total	\$ 27,500.00	\$ 1,028,970.00	\$ 249,726.52	\$ 20,970.00	\$ 26,531,433.73	\$ 10,852,094.65	\$ 2,191,269.11	—	\$ 18,719.30	\$ 40,920,683.81

(1) Permit Rental — Special Renewals (\$1,528,189.50)

(2) Permit Rental — Special Renewals (\$1,002,534.75)

(3) Permit Rental — Special Renewals (\$1,444,172.50)

(4) Permit Rental — Special Renewals (\$34,574.00)

(5) Permit Rental — Special Renewals (\$4, 617.50)

(6) Bonus Royalties from Sept. 1972 to Dec. 1975 (\$445,831.42)

(7) Refund of Previous Years' Rentals — Lease Applications Withdrawn (\$966,422.50)

### Yukon Territory

1970	—	\$ 1,750.00	\$ —	\$ 140.00	\$ 182,448.00	\$ —	\$ 29,349.60	—	—	\$ 213,687.60
1971	—	4,750.00	360.00	275.00	423,944.50(8)	4,256.88	41,506.56	—	—	475,092.94
1972	—	750.00	75.00	2,950.00	507,079.00	23,474.97	—	—	—	534,328.97
1973	—	3,500.00	—	—	417,142.38	19,075.80	—	—	—	439,718.18
1974	—	—	75.00	180.00	409,060.00	24,364.11	—	—	—	433,679.11
1975	—	—	3,610.00	90.00	204,281.25	177,504.68	—	—	—	385,485.93
1976	—	—	45.00	50.00	104,353.00	144,461.21	—	—	—	248,909.21
Total	—	\$ 10,750.00	\$ 4,165.00	\$ 3,685.00	\$ 2,248,308.13	\$ 393,137.65	\$ 70,856.16	—	—	\$ 2,730,901.94

(8) Permit Rental — Special Renewals (\$24,960.00)

### Total Revenues 1970 to 1976

1970	\$ 4,653,319.98
1971	5,785,005.26
1972	5,459,645.14
1973	6,595,579.34
1974	5,608,606.26
1975	7,690,607.76
1976	7,858,822.01
Total	\$ 43,651,585.75

**Table 6 — Gross revenue, oil and gas (fiscal year)  
Northwest Territories**

Fiscal Year	Licence fee	Permit fee	Transfer fee	Lease fee	Rentals	Royalties	Forfeiture	Cash bonus	Misc.	Total
1969-70	\$ 3,800.00	\$ 391,692.70	\$ 59,080.00	\$ 2,240.00	\$ 2,093,730.05	\$ 19,630.00	\$ 19,852.44	—	\$ 2,296.10	\$ 2,592,321.29
1970-71	5,800.00	101,508.60	60,921.52	1,450.00	3,396,332.82	255,259.00	729,500.39	—	1,930.17	4,552,702.50
1971-72	5,550.00	400,000.00	52,105.00	1,110.00	4,182,655.72(1)	301,562.00	476,328.66	—	1,848.71	5,421,160.09
1972-73	2,550.00	234,500.00	41,965.00	3,200.00	4,493,538.70(2)	303,427.08	384,624.03	—	553.27	5,464,358.08
1973-74	4,100.00	189,500.00	19,440.00	2,170.00	4,808,931.18(3)	729,372.07	188,606.71	—	5,022.14	5,947,142.10
1974-75	3,125.00	31,220.00	41,680.00	4,810.00	3,899,447.35(4)	1,283,911.85	147,713.98	—	2,290.53	5,414,198.17
1975-76	1,320.00	—	8,955.00	4,040.00	3,718,493.34(5)	4,352,171.61(6)	165,716.01	—	1,438.75	8,252,134.71
1976-77	3,450.00	—	14,870.00	3,960.00	4,343,465.73(7)	4,672,663.83	142,315.07	—	5,138.65	9,185,863.28
Total	\$29,695.00	\$1,348,421.30	\$299,016.52	\$22,980.00	\$30,936,594.89	\$11,917,997.44	\$2,254,657.29	—	\$20,518.32	\$46,829,880.76

(1) Permit Renewals (Rental) — Special (\$1,607,455.50)  
(2) Permit Renewals (Rental) — Special (\$1,163,492.75)  
(3) Permit Renewals (Rental) — Special (\$1,283,214.50)  
(4) Permit Renewals (Rental) — Special (\$34,574.00)  
(5) Permit Renewals (Rental) — Special (\$4,617.50)  
(6) Bonus Royalties from Sept. 1972 to Jan. 1976 (\$498,456.45)  
(7) Refunds of Previous Years' Rentals — Lease Application (\$966,425.50)

**Yukon Territory**

1969-70	—	\$10,250.00	\$ —	\$ —	\$ 30,749.50	\$ —	\$ —	—	—	\$ 40,999.50
1970-71	—	4,750.00	25.00	190.00	364,604.75	—	41,306.56	—	—	410,876.31
1971-72	—	—	410.00	85.00	120,688.25(8)	967.37	—	—	—	130,800.62
1972-73	—	750.00	—	2,950.00	453,756.50	24,865.72	—	—	—	487,322.22
1973-74	—	3,500.00	—	—	357,644.38	14,073.52	—	—	—	375,217.90
1974-75	—	—	75.00	180.00	400,627.00	55,064.20	—	—	—	455,946.20
1975-76	—	—	3,635.00	90.00	184,243.25	195,397.97	—	—	—	383,366.22
1976-77	—	—	1,095.00	80.00	130,779.75	122,435.71	—	—	—	254,390.46
Total	—	\$19,250.00	\$5,240.00	\$3,575.00	\$2,048,093.38	\$421,454.49	\$41,306.56	—	—	\$2,538,919.43

(8) Permit Renewals (Rental) — Special (\$24,960.00)

**Grand Total Revenues**

1969-70	\$ 2,633,320.79
1970-71	4,963,578.81
1971-72	5,551,960.71
1972-73	5,951,680.30
1973-74	6,322,360.00
1974-75	5,870,144.91
1975-76	8,635,500.93
1976-77	9,440,253.74
Total	\$49,368,800.19



Constructing the Sarpik man-made island in the shallow waters of the Beaufort Sea.



Completed island, Sarpik, during drilling operations.



# Drilling Activities

Figures 10 and 11, showing the number and total depth of wells drilled North of 60 in the last ten years, indicate the number drilled decreased from 42 in 1975 to 30 in 1976 and the total depth decreased by 29 per cent.

Drilling operations were concentrated in four areas: Mackenzie Delta/Tuktoyaktuk area, Mackenzie Bay, Beaufort Sea and the Arctic Islands — specifically in the Sverdrup Basin.

Approximately 70 per cent of the footage drilled in 1976 was exploratory, with four wells reporting discoveries of oil and gas. Nine development wells were drilled in 1976 and, of these, eight were suspended (one oil, one oil and gas, and six gas wells).

Drilling operations and production facilities North of 60 were regularly inspected by Oil and Gas Conservation Engineers and Technicians, of the Northern Non-Renewable Resources Branch, to ensure that safe operating practices were being followed, that the objectives of conservation of oil and gas resources were being met, and that contingency plans for the protection of the environment from blowouts and oil spills were adequate.

Wells completed or abandoned in 1976 are listed in Table 7 and also shown in Figure 12 to 14 inclusive.

## Offshore Drilling Activities

### **Arctic Islands**

Drilling from man-made ice islands was continued by Panarctic Oils Ltd., with four wells drilled in 1976. These included the first two exploratory wells drilled from an ice island — Panarctic et al Jackson G-16, and Panarctic et al Jackson Bay G-16A. The latter well was a gas discovery. Applications have been submitted for five additional ice island wells to be drilled in 1977.

### **Beaufort Sea**

Imperial Oil Limited continued its program of island construction using material dredged from the sea-bottom or trucked to the site. Five new islands were created, raising the company's total to fourteen. Applications have been submitted for the construction of two additional islands during the summer of 1977.

Sun Oil Company did not construct any new islands, but did start drilling a second well from a previously constructed island.

The summer of 1976 saw the start of a new age in exploration North of 60. The first drilling to probe for potential hydrocarbon accumulations beneath the Beaufort Sea was commenced, at a mobilization cost to Dome Petroleum Ltd. of approximately \$150 million.

Many years of geological and geophysical exploration by the petroleum industry has delineated huge structures capable of trapping hydrocarbons, and on this basis, Dome Petroleum Ltd. applied to the Federal Government for approval to drill wells in the area. Approval in principle was given to the company in 1974, subject to several conditions which had to be met before drilling actually commenced. Two of the most important conditions were the provision of an adequate back-up drilling system in case a relief well had to be drilled, and the undertaking of a comprehensive environmental assessment program.

Through its affiliation with the Arctic Petroleum Operators Association (APOA) and through a variety of its own research projects, Dome spent millions of dollars in environmental research in the Beaufort Sea. Projects varied from baseline studies of flora and fauna and the effects of pollution on sea birds and mammals to related engineering and physical environmental problems such as oil-spill clean up, ice movement and ocean current research. Special quick-disconnect drilling systems and blow-out preventor housings (silos) had to be designed to prevent damage from the arctic ice.

Dome, through its wholly owned subsidiary, Canadian Marine Drilling Ltd. (CanMar), bought two ships and had them converted and strengthened into drillships capable of working in ice-infested waters. The drillships, renamed *CanMar Explorer I* and *CanMar Explorer II*, were to be completed in time to test them and get them into the Beaufort Sea before freeze-up in late 1975. A strike in the Galveston, Texas, shipyards delayed completion of the ships, preventing them from getting into the Arctic during 1975. However, several ships in CanMar's fleet of 10 (including barges, tugs, etc.) were in the Beaufort Sea and had prepared two sites for drilling.

Fig.10

## WELLS DRILLED

YUKON TERRITORY - NORTHWEST TERRITORIES

Number of Wells Drilled to end 1976(865)

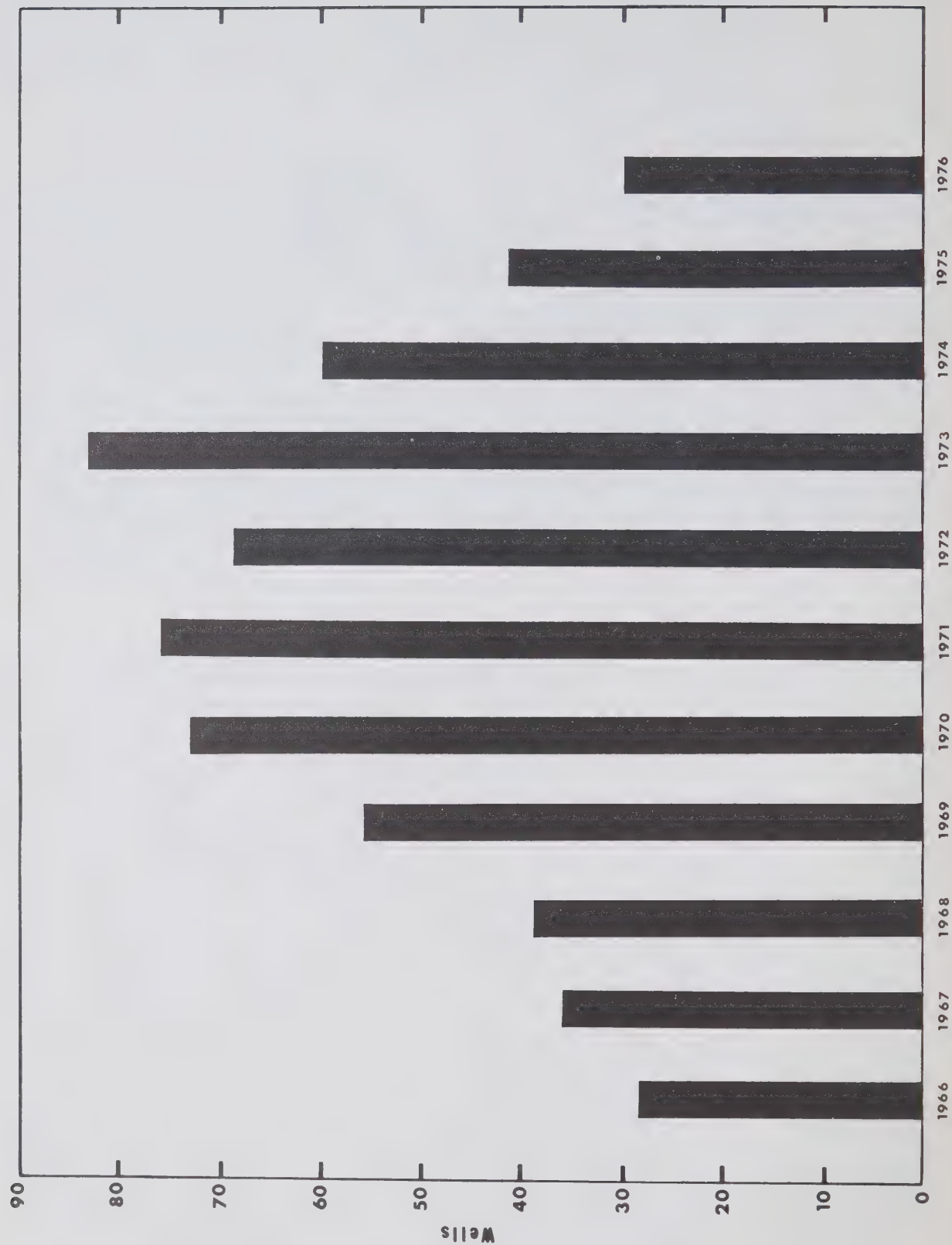
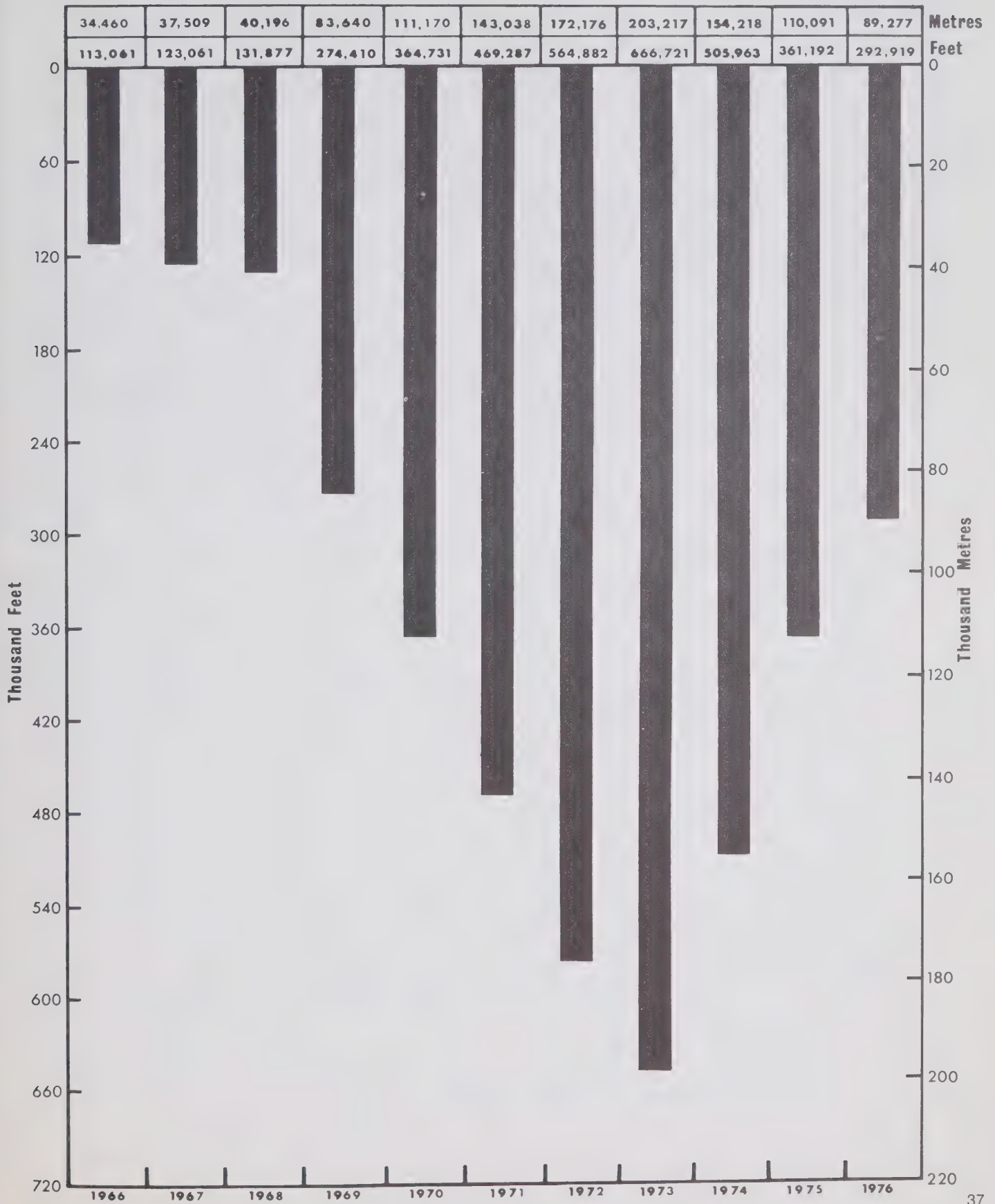


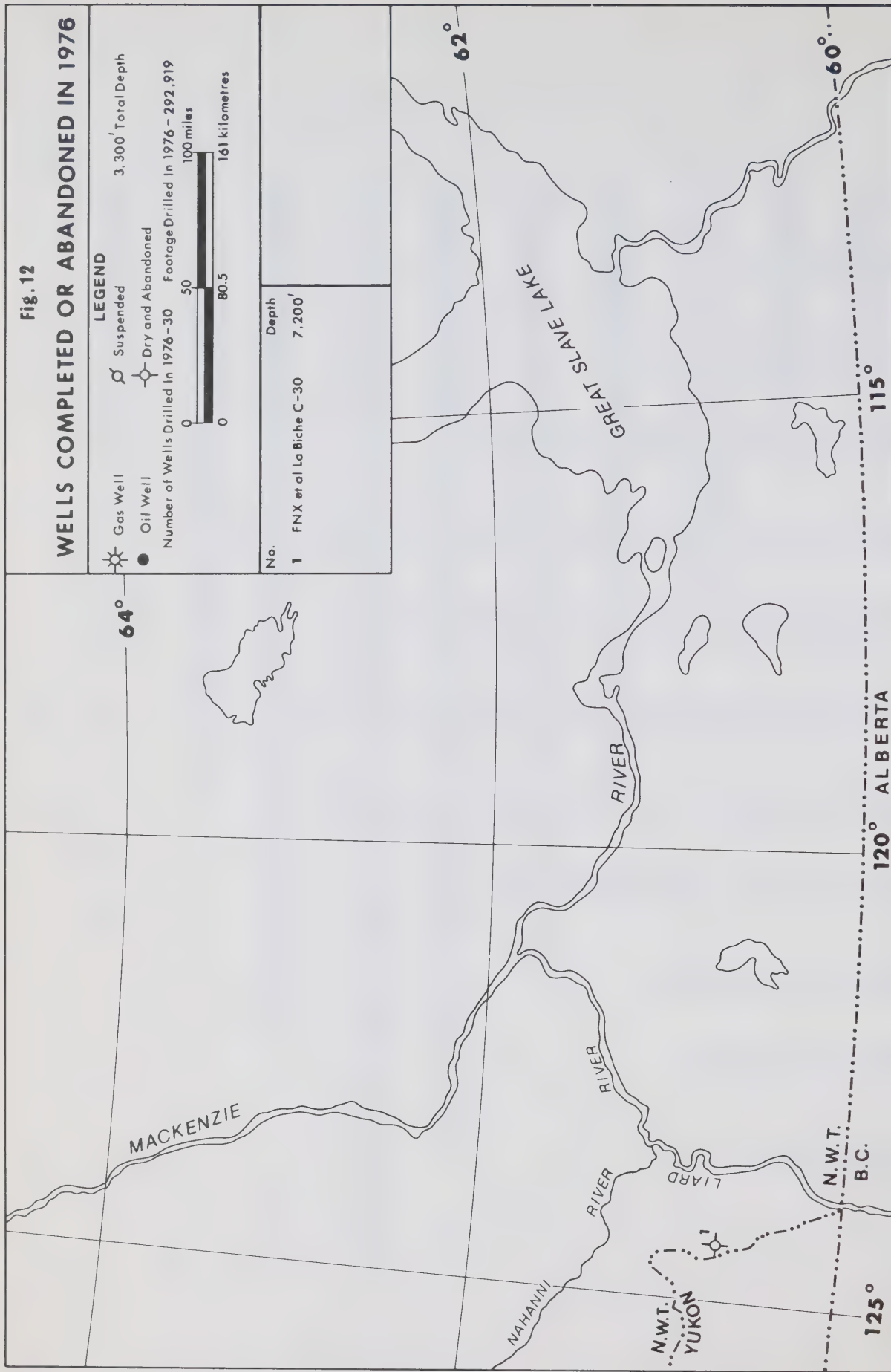
Fig.11

# DEPTH DRILLED

YUKON TERRITORY AND NORTHWEST TERRITORIES







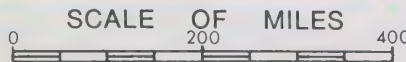
**Table 7 — Wells Abandoned or Completed in 1976**  
A total of 30 wells drilled and completed or abandoned is recorded for 1976. The total footage was 292,919 feet. (D & A indicates “dry and abandoned”, J & A indicates “junked and abandoned” and P & A indicates “plugged and abandoned”).

Northwest Territories — Arctic Islands				
Name of Well	Spudded	Completed	Status	Total Depth (In Feet)
Elf et al Dyer Bay L-49 L-49-76-10-121-30	01-11-75	20-02-76	D & A	10,405
Panarctic Elf Bar Harbour E-76 E-76-74-20-123-30	24-11-75	02-01-76	D & A	6,022
Panarctic Tenn CS N.W. Hecla M-25 M-25-76-30-111-00	14-03-76	18-04-76	Gas Well	3,960
Panarctic Tenn Sun Dome Jackson G-16 G-16-78-10-101-00	05-02-76	15-03-76	J & A	3,944
Panarctic Tenn Sun Dome Jackson G-16A G-16-78-10-101-00	16-03-76	30-04-76	Gas Well	5,242
Panarctic et al Key Point O-51 O-51-76-20-104-00	25-10-75	24-02-76	D & A	11,425
Panarctic et al Sabine Bay A-07 A-07-75-30-110-00	23-10-75	24-02-76	D & A	17,037
Panarctic Tenn et al W. Hecla C-05 C-05-76-30-110-00	28-04-76	16-05-76	D & A	4,060
Panarctic W. Hecla P-62 P-62-76-30-110-30	07-01-76	22-02-76	Gas Well	3,700
Panarctic W. Bent Horn E-43 E-43-76-30-104-00	16-01-76	17-04-76	D & A	11,060
Panarctic et al W. Bent Horn A-02 A-02-76-30-104-00	06-05-76	01-08-76	Oil Well	11,026
Texex King Point West B-53 B-53-75-40-108-00	30-09-75	01-01-76	D & A	10,258
Northwest Territories — Mainland				
FNX et al La Biche C-30 C-30-60-40-124-30	01-01-76	28-03-76	D & A	7,200
Gulf Mobil Kamik D-48 D-48-69-00-133-15	23-12-75	04-04-76	Gas Well	10,614
Gulf Mobil Parsons N-17 N-17-69-00-133-00	18-12-75	13-04-76	Gas Well	10,812

Gulf Mobil Parsons D-20 D-20-69-00-133-30	21-04-76	22-11-76	Gas Well	13,550
Gulf Mobil Parsons L-43 L-43-69-00-133-30	10-12-75	04-03-76	Gas Well	10,844
Gulf Mobil Siku C-11 C-11-69-10-133-30	26-12-75	22-03-76	Gas Well	10,810
Gulf Mobil Siku A-12 A-12-69-10-133-30	14-04-76	26-07-76	Gas Well	10,787
Gulf Imperial Shell Tununuk F-30 F-30-69-00-134-30	03-04-76	30-06-76	D & A	11,950
Hunt Dome Kopanoar D-14 D-14-70-30-135-00	09-08-76	27-09-76	P & A	3,760
Imp Delta 5 Ikattok J-17 J-17-69-20-136-15	10-07-75	27-02-76	D & A	12,500
Imp Kugmallit H-59 H-59-69-40-133-15	30-09-76	10-11-76	D & A	7,195
Imp Netserk F-40 F-40-69-40-135-45	08-11-75	09-05-76	Potential Gas Well	14,338
Imp Sarpik B-35 B-35-69-30-136-15	02-04-76	04-09-76	D & A	10,796
Imp Delta 5 Wagnark C-23 C-23-69-20-133-15	07-04-76	05-10-76	D & A	13,949
Shell Niglintgak B-19 B-19-69-20-135-15	18-10-75	22-02-76	Potential Oil and Gas Well	10,315
Shell Ulu A-35 A-35-68-50-135-45	15-03-76	22-09-76	D & A	12,860
SOBC North Ellice J-23 J-23-69-20-135-45	22-10-75	15-03-76	D & A	11,500
Sun et al Garry P-04 P-04-69-30-135-30	25-08-75	05-01-76	Potential Oil and Gas Well	11,000

#### Yukon Territory

Nil



**LEGEND**

- Product Pipeline
- Westcoast Transmission Gas Pipeline
- - - Can.Arctic Gas Proposed Pipeline
- ▲ Oil Refinery Gas Plant
- Green Indicates Oil Well or Oil Field
- Red Indicates Gas Well or Gas Field
- M.O.T. & Territorial Gov't Airports



# Oil and Gas Fields and Discoveries

## YUKON TERRITORY

- 1 Beaver River Gas Field
- 2 Chance Gas Field
- 3 Socony Mobil et al Blackie No. 1
- 4 Socony Mobil et al Birch Y.T. B-34

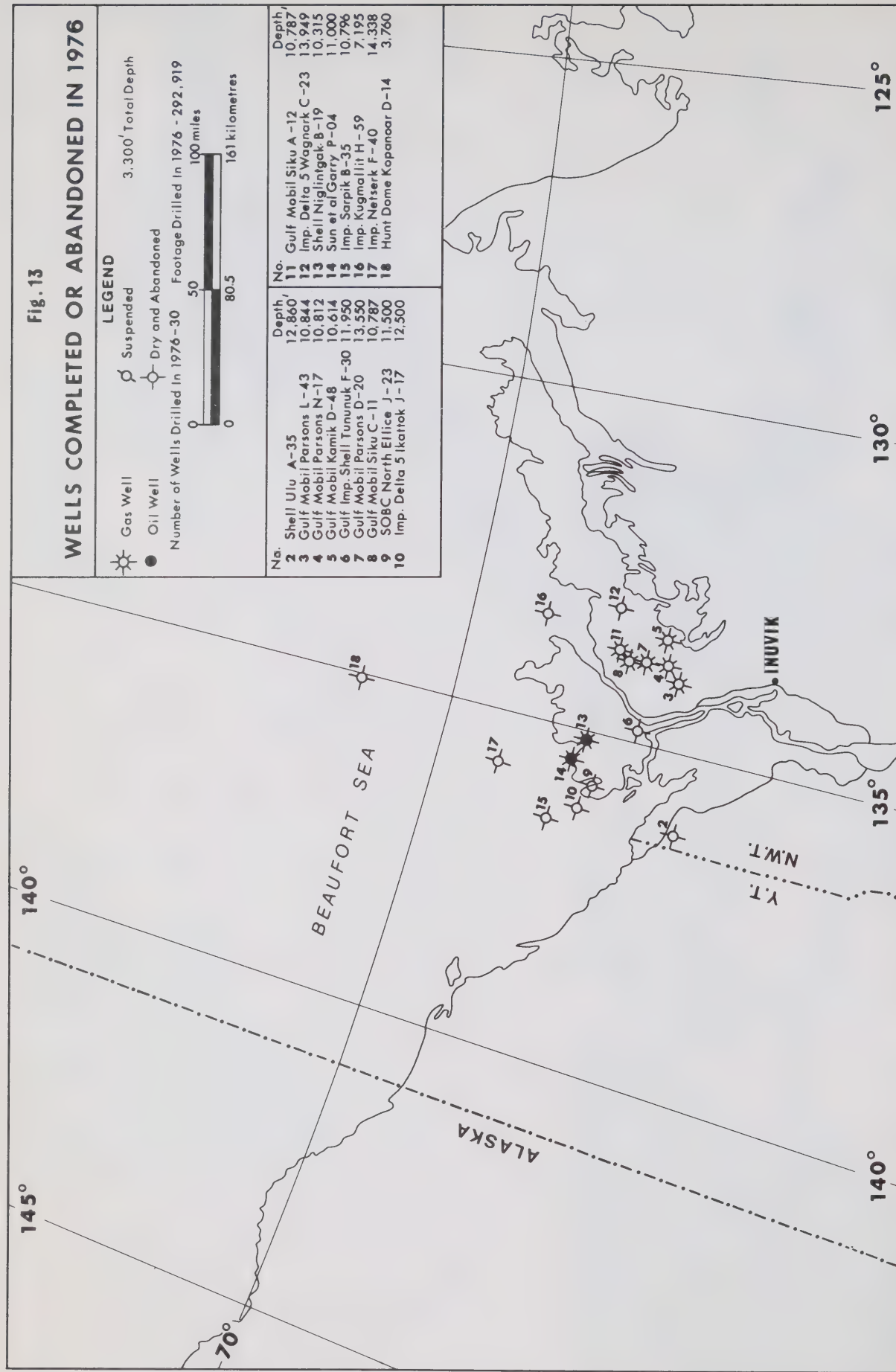
## NORTHWEST TERRITORIES

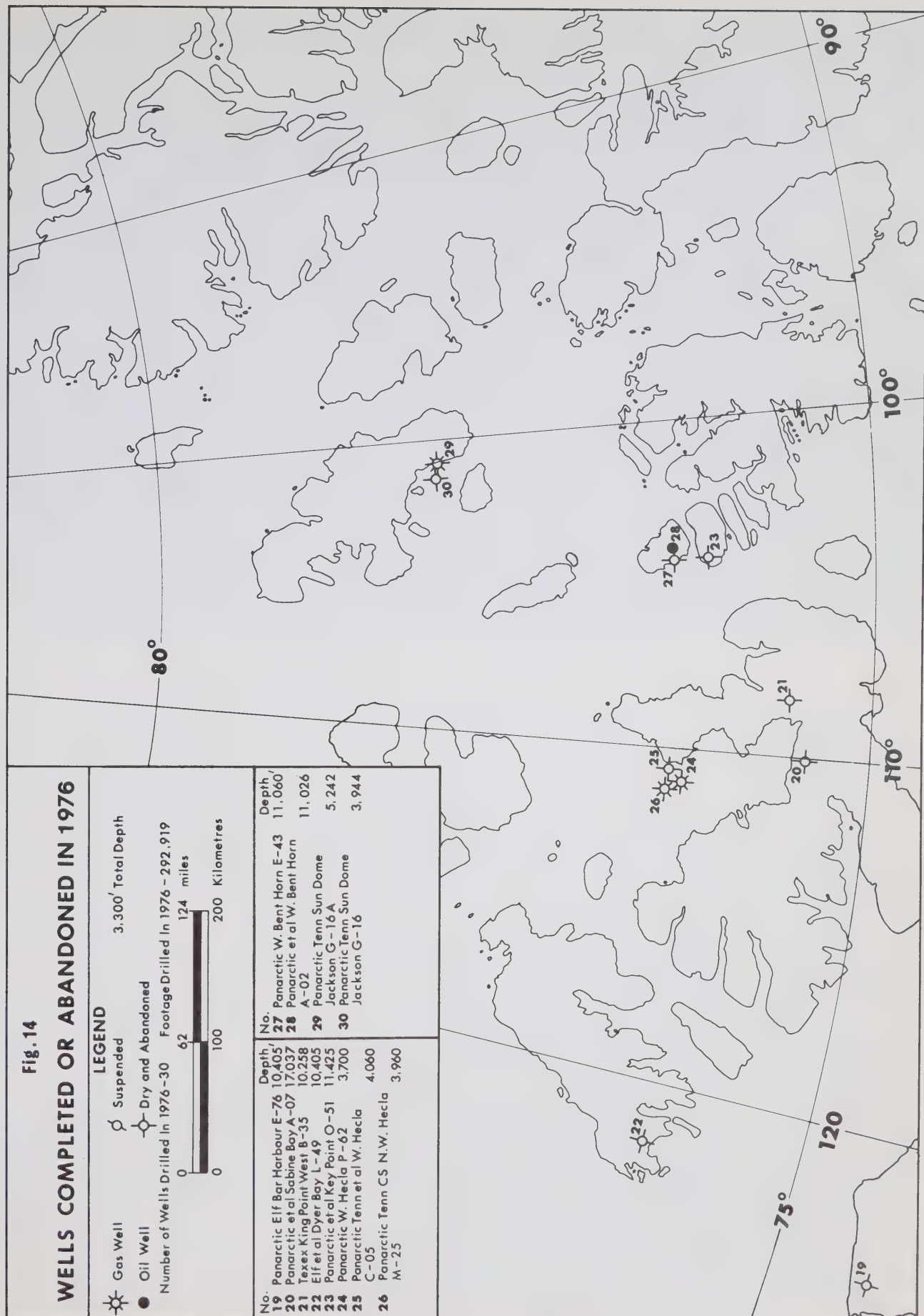
- 5 Pointed Mountain Gas Field
- 6 Rabbit Lake Gas Field
- 7 C.P.O.G. et al LaBiche F-08
- 8 H.B. Cameron Hill A-05
- 9 S. Island River Gas Field
- 10 Home Signal Celibeta H-78
- 11 Shell H.B. Grumbler G-63
- 12 Sun Netla C-07
- 13 Texaco Bovie Lake J-72
- 14 Union Pan Am. Trainer Lake C-39
- 15 Pacific Amoco Tathlina N-18
- 16 Norman Wells Oil Field
- 17 Taglu Gas Field
- 18 Parsons Gas Field
- 19 Gulf Imperial Shell Titalik K-26
- 20 Gulf Imperial Shell Reindeer F-36
- 21 Gulf Mobil Ya Ya P-53      A-28 Gas Pools
- 22 Shell Niglintgak H-30      M-19
- 23 Imperial I.O.E. Mallik L-38
- 24 Imperial Ivik J-26
- 25 I.O.E. Mayogiak J-17
- 26 I.O.E. Atkinson H-25
- 27 Shell Kugpik O-13
- 28 Imp. Adgo F-28
- 29 Ashland Tedji Lake F-24
- 30 Kumak Oil and Gas Field
- 31 Garry Oil and Gas Field
- 32 Imp. Netserk F-40
- 33 Gulf Mobil Kamik D-48

## ARCTIC ISLANDS

- 51 Drake Point Gas Field
- 52 Hecla Gas Field
- 53 King Christain Gas Field
- 54 Panarctic Tenneco et al Kristoffer Bay B-06
- 55 Dome Arctic Ventures Wallis K-62
- 56 Thor Gas Field
- 57 Panarctic Romulus
- 58 Dome Sutherland O-23
- 59 Panarctic Bent Horn N-72, A-02
- 60 Panarctic Jackson Bay G-16A











Imp. Kugmallit H-59 in the Beaufort Sea.



CanMar Explorer I drillship on location at Tingmiark in the Beaufort Sea.

In the spring of 1976, Cabinet gave final approval for the drilling of the wells. *CanMar Explorer I* and a converted Norwegian drillship (the *Havdrill* renamed the *CanMar Explorer III*) headed north from Victoria, around Alaska, into the Beaufort Sea. The other drillship, *CanMar Explorer II*, not then completed, would enter the Beaufort Sea through the Northwest Passage in late summer of 1976.

Dome Gulf *et al.* Tingmiark K-91 was spudded on August 9, 1976 and reached a total depth of 10,010 feet before drilling was stopped by the September 15 time limit placed on drilling by the Federal Government. This well reached a potential gas reservoir at approximately 10,000 feet below sea level. There was not enough time remaining before freeze-up to evaluate the discovery fully so Dome proceeded to secure the well and suspend operations. *CanMar Explorer I* suspended operations and headed for Herschel Island to winter over until the 1977 drilling season.

Hunt Dome Kopanoar D-14, spudded on August 8, 1976 was abandoned at a total depth of 3,760 feet on September 27, 1976. A high pressure fresh water source created drilling problems at that depth forcing abandonment of the well. The water flow was sealed off, the well abandoned, and the drillship was moved about 600 feet south to spud Hunt Dome Kopanoar M-13. This well was drilled to a depth of 1,590 feet before being suspended for the winter. *CanMar Explorer III* headed to Tuktoyaktuk for the winter. It is now estimated that these initial wells will cost \$40-\$50 million each, making them the most costly ever drilled.

The Federal Government had also approved the setting of surface casing at four other locations in preparation for the 1977 drilling season. *CanMar Explorer II* had managed to drill to 1,100 feet at Dome Hunt Nektoralik K-59 and set surface casing before suspending operations and heading for Tuktoyaktuk.

**Catamaran will support Beaufort drilling operations**  
Canadian Marine Drilling (CanMar) ordered a 5-ton catamaran equipped with a Lockheed Clean Sweep oil recovery device to support its drilling operations in the Beaufort Sea in 1976.

In addition to the Clean Sweep, which can treat 200 gallons of oil contaminated water per minute the vessel will have a high capacity space heater to warm the oil collection trough in the recovery drum and a tumbler bar to push floating pieces of ice behind the craft. Any recovered oil will be incinerated on the drillship.



## Operations

Surface geological and photogeological surveys made by the Industry in the Northwest Territories and Yukon Territory increased in 1976 over those of 1975, and seismic crew months decreased by approximately 9 per cent — 52 crew months as against 57 in 1975 (Table 7 and Figure 15). A total of 6,533 land seismic line miles were recorded in 1976 compared to 6,886 land seismic line miles the previous year, and 9,076 marine seismic line miles, compared to 14,999 marine seismic line miles in 1975 (Table 7 and Figure 16). As seismic crew months are an excellent barometer of the probable magnitude of the drilling activity for the following year, the 1976 decrease would seem to indicate a further reduction in drilling activities in 1977.

Seismic activity in 1976 was generally restricted to the Mackenzie Delta and the Arctic Islands. Detailed seismic work was carried out in the Mackenzie Delta/Beaufort Sea areas by, among others, Imperial Oil Limited, Gulf Oil Canada Limited, Shell Oil Canada Limited, Mobil Oil Ltd., and Chevron Standard Ltd. There were no land-participation surveys in 1976. In the Arctic Islands major seismic programs were continued by Panarctic Oils Ltd. on Prince Patrick and Melville islands and, on ice in the inter-island area, by the Sun Oil Company using conventional land seismic techniques. The two companies utilized nine seismic crews during the period November to June.

Marine seismic operations were carried out in the Lancaster Sound area by Norlands, in the inter-island areas by the Arctic Island Offshore Group operated by Sun Oil Company Limited, and in the Beaufort Sea by Dome Petroleum Ltd.

Seismic surveys in the Davis Strait and Baffin Bay areas were carried out by Imperial Oil Limited, Aquitaine Co. Can. Ltd., Shell Oil Canada Limited. Participation-type programs were operated by Eureka Exploration and Geophysical Services Incorporated.

### Design for icebreaker follows testing program

Scale model testing of a proposed 36,000-ton Polar 7 Class icebreaker has been completed by the Marine Dynamics and Ship Laboratory of the National Research Council's Division of Mechanical Engineering, and the Canadian Coastguard has awarded a contract to German and Milne Ltd., naval architects, to produce a study and design for the ship.

The 600-foot vessel would be powered by three propellers and have a design power up to 90,000 hp. It would be the largest and most powerful icebreaker in the world when and if it is built. The Soviet Union currently has a 70,000 hp. vessel.

Meanwhile, Pratt and Whitney Aircraft of Canada Ltd. has been awarded a contract by the federal Ministry of Transport to study the feasibility of reducing significantly the fuel consumption of that company's 40,000 hp Class FT4 marine gas turbine engine, one of the units under consideration to power this vessel.

This improvement would be achieved by recovering and using substantial energy from the exhaust gases and by providing as much as 35 per cent additional power through a helper turbine.

The need for such high power levels has been demonstrated through studies of the power requirements for freighters capable of operating in Arctic waters.

### \$80 million Arctic exploration program finalized

Exploration activity in the Arctic Islands has been given a much needed boost with the agreement by six companies for an \$80 million program to be carried out over the next four years.

The agreement intensifies exploration in Canada's Arctic Islands through a *farmin* agreement to acreage owned by Sun Oil Company and/or Global Arctic Islands Ltd. Sun owns varied interests in approximately 33 million gross acres (12.1 million net); Global has a joint interest in approximately 25 million of these gross acres. Based on existing seismic work, prospective drilling locations have been identified and a drilling program will commence in the 1976-77 drilling season.

Imperial Oil Ltd., Gulf Oil Canada Ltd., Panarctic Oils Ltd. and Petro-Canada Exploration Inc. will fund the program through a *farmin* on the 33 million gross acres. The agreement does not include Sun's acreage in the Mackenzie Delta area.

Panarctic, with 22 per cent interest in the program, will be the operator. Imperial has a 33 per cent stake, Gulf 25 per cent and Petro-Canada 18 per cent. The *farmors* will retain a 40 per cent share of any production. The first well in the program will be the Panarctic NE Drake P-40, a 4,100 foot test located on ice about 20 miles off the east coast of Sabine Peninsula, Melville Island.

Most of the acreage involved is located offshore and will necessitate drilling from ice platforms — a technique which has been successfully developed by Panarctic Oils.

Sun Oil is the project manager for the nine-company Arctic Islands Offshore Group which has already completed more than \$30 million worth of seismic work (much of which was on acreage included in the *farmout*) in the first two years of a planned three-year \$45 million program. The work is continuing through the 1976-77 winter season.



### Exploration and Drilling Expenditures

Total industry expenditures, which include in-house seismic processing, overhead, land retention, royalties and taxes, exceed \$350 million in 1976.

Field expenditures on oil and gas exploration North of 60 exceeded \$240 million in 1976, approximately \$20 million more than in 1975 (Figure 17). These expenditures are available for credits for the maintenance and retention of oil and gas permits and leases in the North. Expenditures for exploratory and development drilling amounted to approximately \$170 million, up \$10 million from the previous year.

Total geophysical and geological expenditures increased to approximately \$70 million, up \$10 million from 1975.

Figure 17 shows that field expenditures decreased by approximately 11 per cent in 1974 from the 1973 high, 6 per cent from 1974 to 1975, but increased by 9 per cent from 1975 to 1976. If, as anticipated, additional permits and leases are issued in 1977, and if offshore drilling continues in the Beaufort Sea, expenditures related to oil and gas activities are expected to increase to \$300 million per year. With development drilling in the Mackenzie Delta and with the possible construction of a Mackenzie Valley gas pipeline, expenditures in the late late 1970's may exceed \$1 billion a year.



Moving a drilling rig in the Sverdrup Basin.

Fig. 15

# EXPLORATION ACTIVITY

YUKON TERRITORY AND NORTHWEST TERRITORIES

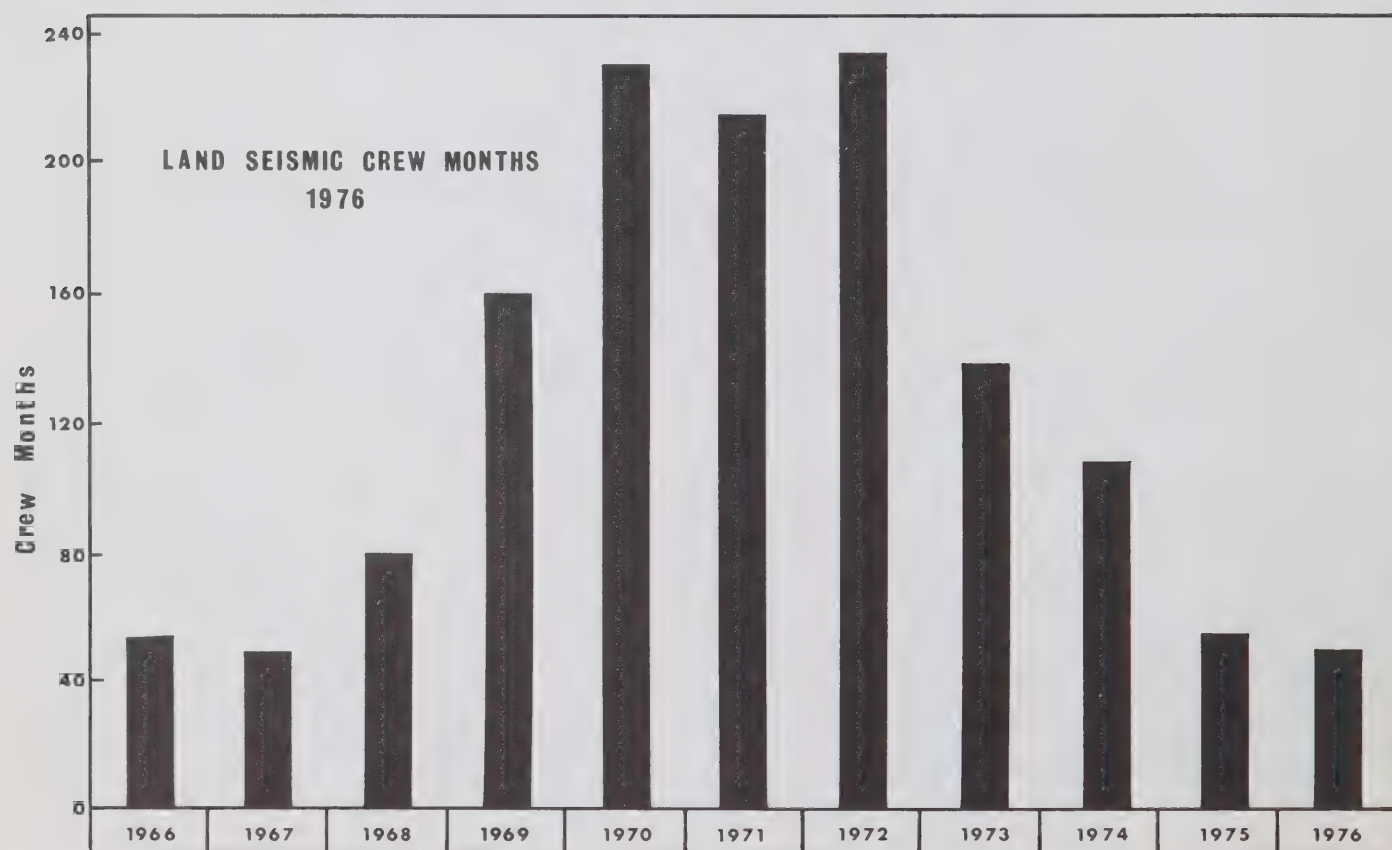
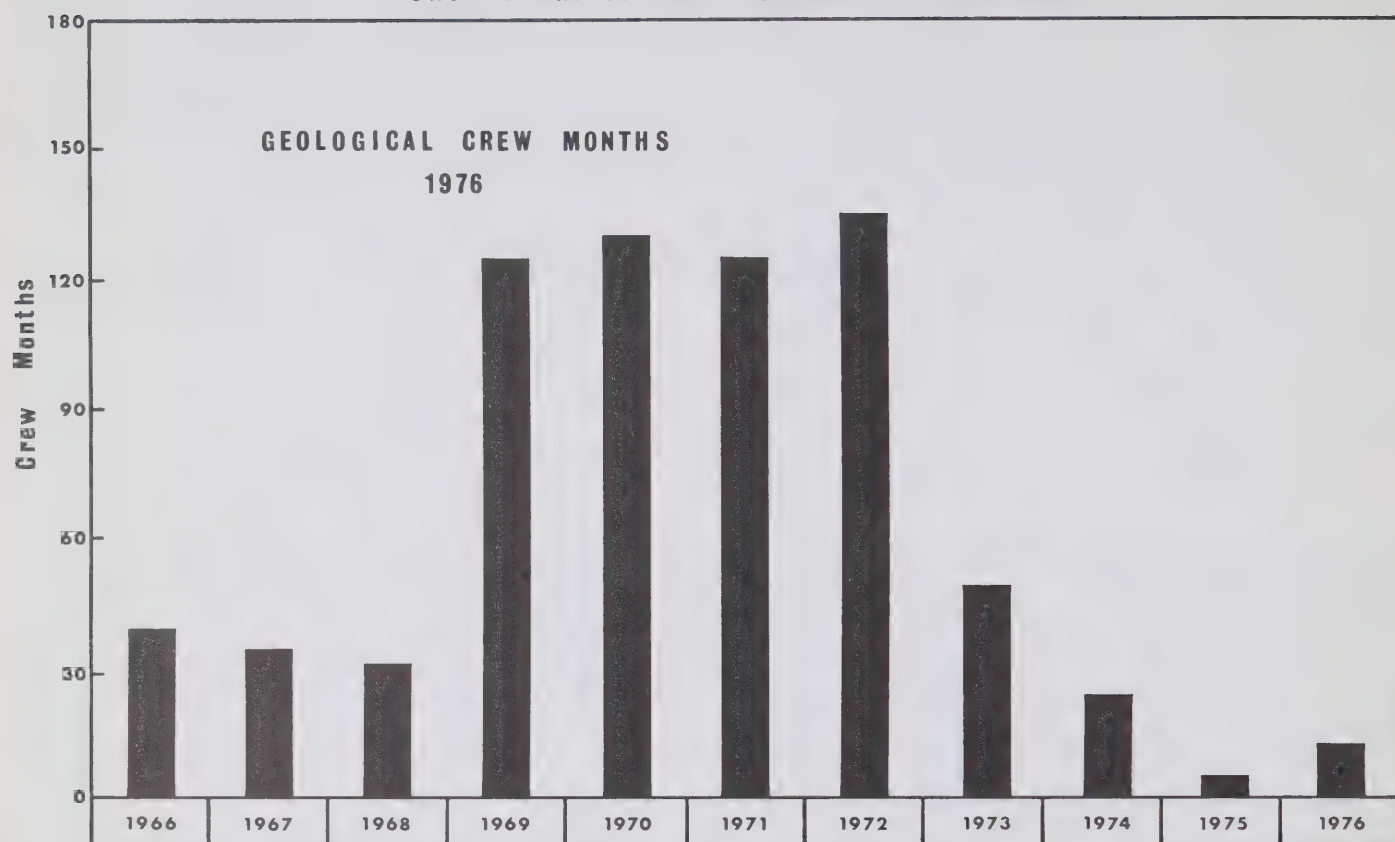


Fig. 16

# EXPLORATION ACTIVITY

YUKON TERRITORY AND NORTHWEST TERRITORIES

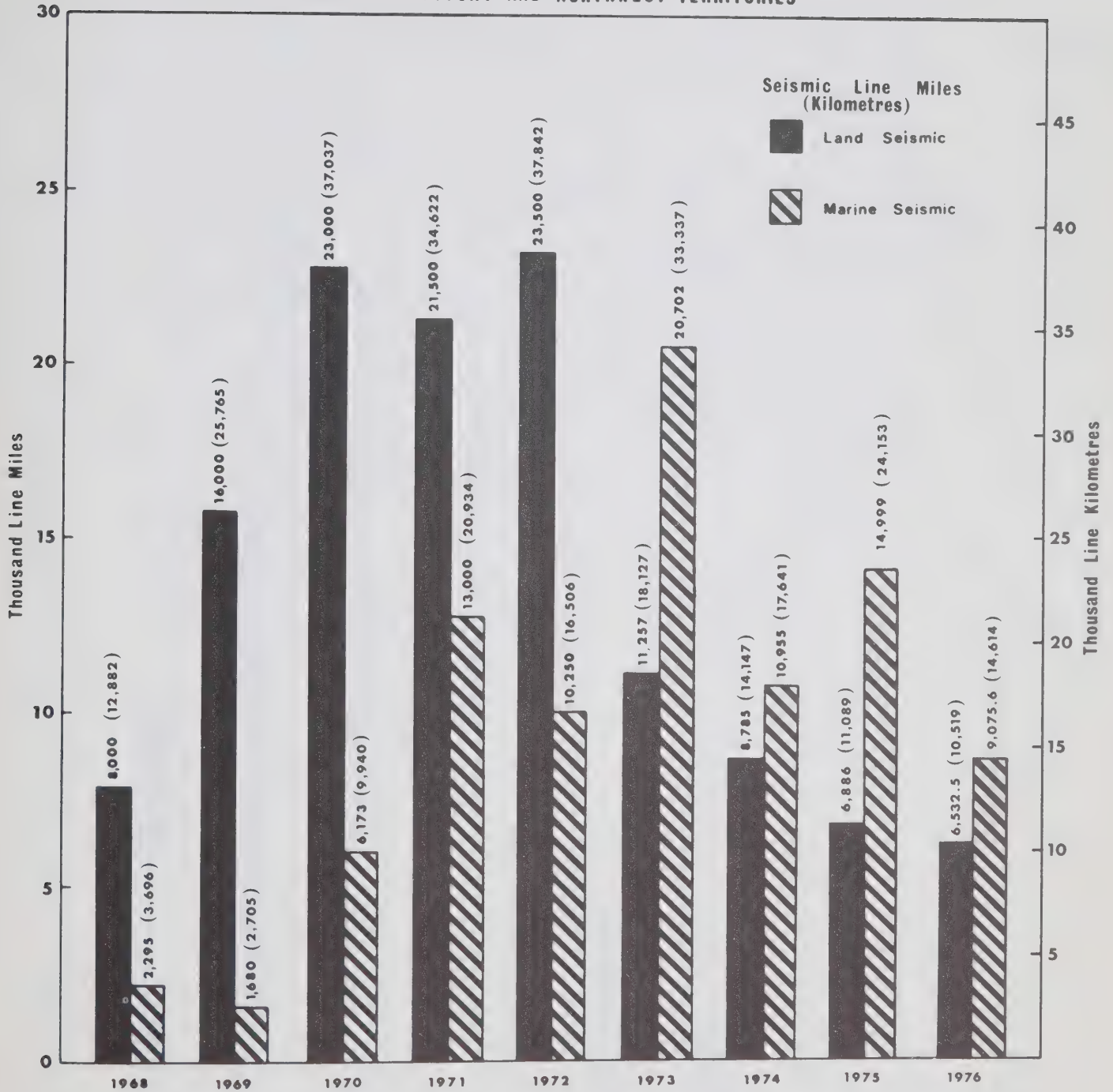
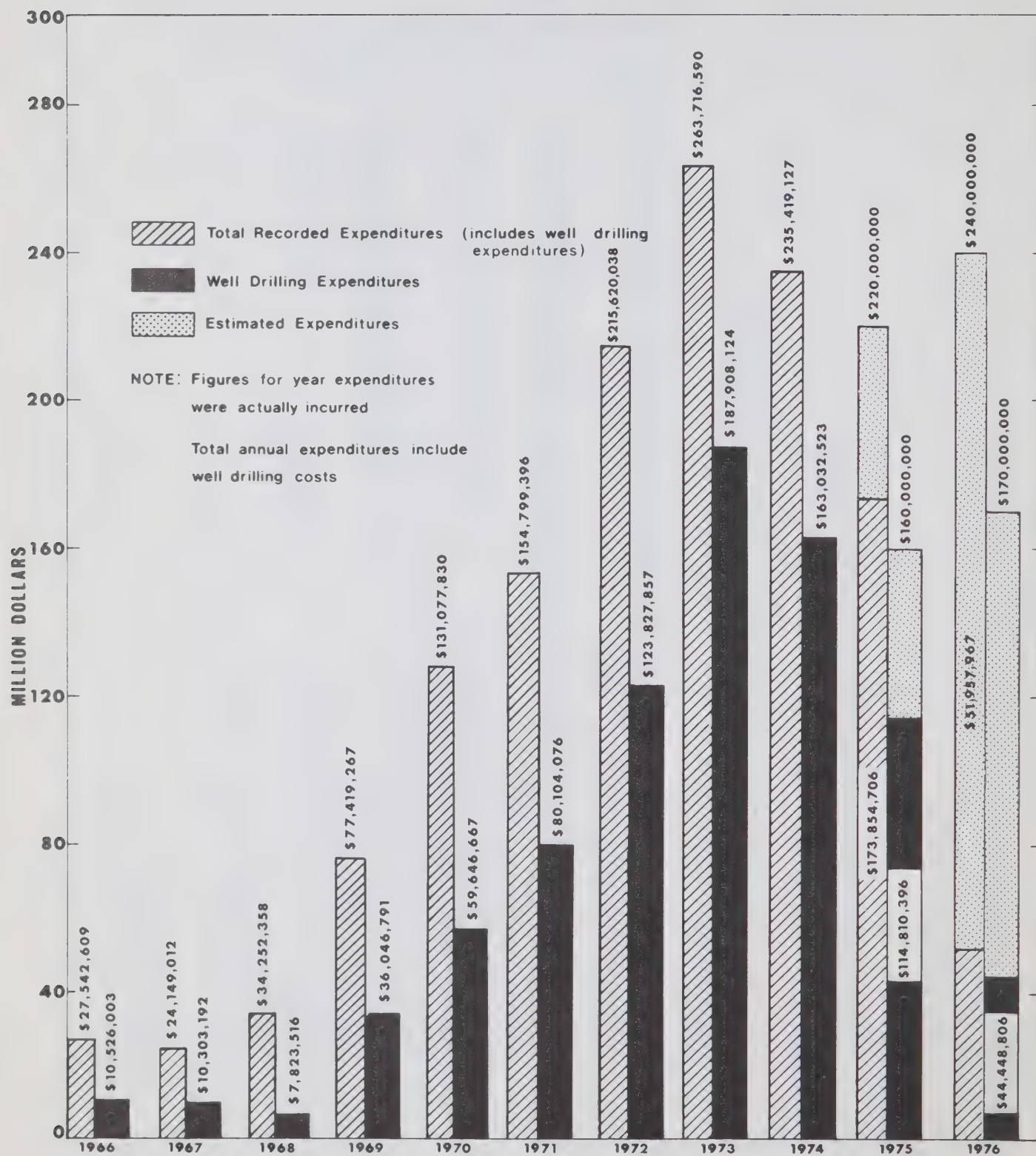




FIG. 17

# **OIL & GAS EXPLORATION EXPENDITURES SUBMITTED FOR WORK CREDITS**



**Table 8 — 1973-1976 Exploration survey statistics**

Geological	Yukon Territory	N.W.T. mainland	Mackenzie Delta	Beaufort Sea	Arctic Islands and surrounding water	Baffin Bay — Davis Strait	Total
<i>Crew Months</i>							
1973	3.0	9.0	0	0	37.0	1.0	50.0
1974	3.5	1.5	4.5	0	15.5	0	25.0
1975	0	0	0	0	3.5	1.0	4.5
1976	4.0	1.5	1	0	5.5	1.0	13.0
<i>Land seismic crew months</i>							
1973	10.0	25.0	42.0	4.0	58.0	0	139.0
1974	3.0	27.0	41.0	2.0	37.0	0	110.0
1975	0	14.5	10.5	0.1	32.0	0	57.1
1976	0	3.0	18.5	1.0	29.5	0	52.0
<i>Seismic line miles (kilometres)</i>							
<i>Land</i>							
1973	611 (984)	1,152 (1,855)	3,473 (5,593)	470(757)	5,551 (8,939)	0	11,257 (18,127)
1974	121 (195)	1,932 (3,111)	3,229 (5,200)	75 (121)	3,428 (5,520)	0	8,785 (14,147)
1975	0	1,572 (2,531)	679 (1,093)	9 (14)	4,626 (7,449)	0	6,886 (11,089)
1976	0	3,375 (5,435)	2,082 (3,353)	77 (124)	4,036 (6,499)	0	6,532.5(10,519)
<i>Marine</i>							
1973	0	18(29)	0	4,603 (7,412)	5,006 (8,061)	11,075 (17,834)	20,702 (33,337)
1974	0	0	0	1,724 (2,776)	4,159 (6,697)	5,072 ( 8,167)	10,955 (17,641)
1975	0	0	0	2,568 (4,135)	3,341 (5,380)	9,090 (14,638)	14,999 (24,153)
1976	0	0	42.6(69)	2,804 (4,515)	1,336 (2,151)	4,893 ( 7,879)	9,075.6 (14,614)

# Pipelines

## Western Arctic Gas Pipeline Proposals

### **Canadian Arctic Gas Pipeline Ltd. (CAGPL) Proposal**

Early in 1975, applications were filed in Canada and in the United States by Canadian Arctic Gas Pipeline Ltd. for the first-phase approvals required to begin work on the largest and most costly construction project ever planned by private enterprise, the Mackenzie Valley gas transmission system. Canadian Arctic Gas Pipeline Ltd. is a consortium of 16 companies.\*

The composite project would consist of approximately 2,400 miles of main line, of which 195 miles would be in Alaska. Ultimate compression and refrigeration capability installed at full capacity of 4.5 BCFD would amount to a total of 1,900,000 hp. Related pipeline construction by other companies taking gas from the new system would total at least 3,000 miles. The Canadian Arctic Gas venture would, therefore, initiate the largest integrated pipeline complex ever built.

The proposed system would consist of two supply lines, one running 370 miles from the Prudhoe Bay oil and gas field, the other running 20 miles from the Mackenzie Delta Taglu processing plant, the two joining at a point named Tununuk Junction in the Northwest Territories. The supply line would be of 48-inch diameter pipe. A single 48-inch line would then continue south through the Mackenzie Valley for 1400 miles to a point near Caroline in west central Alberta. A smaller 30-inch, 12-mile lateral supply line would link the gas discovery area of Parsons Lake to the main Delta trunk line in the Northwest Territories. From Caroline, the 30-inch, 175-mile western delivery branch would connect to the Alberta Natural Gas pipeline system at Coleman on the Alberta-British Columbia border. A 240-mile, 48-inch eastern delivery line would extend to the Alberta-Saskatchewan border, connecting with the TransCanada Pipeline System at Empress. From this point a 42-inch pipeline would extend approximately 160 miles to Monchy on the Canada-United States border where it would connect to the proposed Northern Border Pipeline system.

\*The 16 companies are: Alberta Natural Gas Company Ltd.; Tenneco Oil and Minerals Limited; the Consumers' Gas Company; Norcen Energy Resources Ltd.; Union Gas Limited; TransCanada Pipelines Limited; Gulf Oil Canada Limited; Imperial Oil Limited, Shell Canada Limited; Columbia Gas Transmission Corp.; Michigan Wisconsin Pipe Line Company; Natural Gas Pipeline Company of America; Northern Natural Gas Company; Pacific Lighting Gas Development Co.; Panhandle Eastern Pipe Line Co. and Texas Eastern Transmission Corp.

### **Foothills Pipe Line Ltd. Proposal**

A "Maple Leaf" Mackenzie Gas Line-Foothills Pipe Line Ltd. is a "Special Act" company, capitalized at 10 million shares, issued and outstanding, of which 80% are held by Alberta Gas Trunk Line Company Ltd. (AGTL) and 20% by or for Westcoast Transmission Company Ltd. — the sponsoring companies. Other sponsoring companies are expected to join as participants provided that they are Canadian-controlled and able to provide substantial aid in getting Beaufort/Mackenzie gas to Canadian markets as soon as possible. Under this proposal an 820-mile, 42-inch, wholly Canadian-owned and operated natural gas transmission main line would be built from the Mackenzie Delta/Beaufort Sea area, up the Mackenzie Valley (following the same route as that proposed by CAGPL) to a point south of Fort Simpson near the point at which the common boundary of Alberta and British Columbia intersects the 60th parallel. From there, a major connection would branch off to connect with the transmission system of Westcoast in the Northwest Territories and northern British Columbia. The main line would continue southeastward in Alberta, using the right-of-way of AGTL to connect with the AGTL main lines system at its "McLeod Junction" west of Edmonton, and thence to link with the existing AGTL and with TransCanada PipeLines (TCPL) systems in Saskatchewan, Manitoba, Ontario and Quebec.

Foothills Pipe Line Ltd. would be responsible for constructing and operating the section north of 60°N; Westcoast, the British Columbia section; AGTL, the section from the 60th parallel to "McLeod Junction"; and TCPL, all territory east of Alberta.

Capital expenditures, including the cost of expanding the Trans-Canada PipeLines Limited system east and of expanding and extending the Westcoast Transmission Co. Ltd. system, is expected to be about \$4.5 billion, \$3.1 billion of which will be for the Canadian portion.

Foothills Pipe Line Ltd. filed formal applications with the Department of Indian and Northern Affairs and the National Energy Board in the first half of 1975. It is estimated that construction of the 42-inch pipeline would require two winter seasons and that the line would be capable of transporting gas to southern Canadian markets two and one-half years after final regulatory approvals are given. The operating pressure of the pipeline would be 1,250



FIG. 18

# NORTHERN PIPELINES

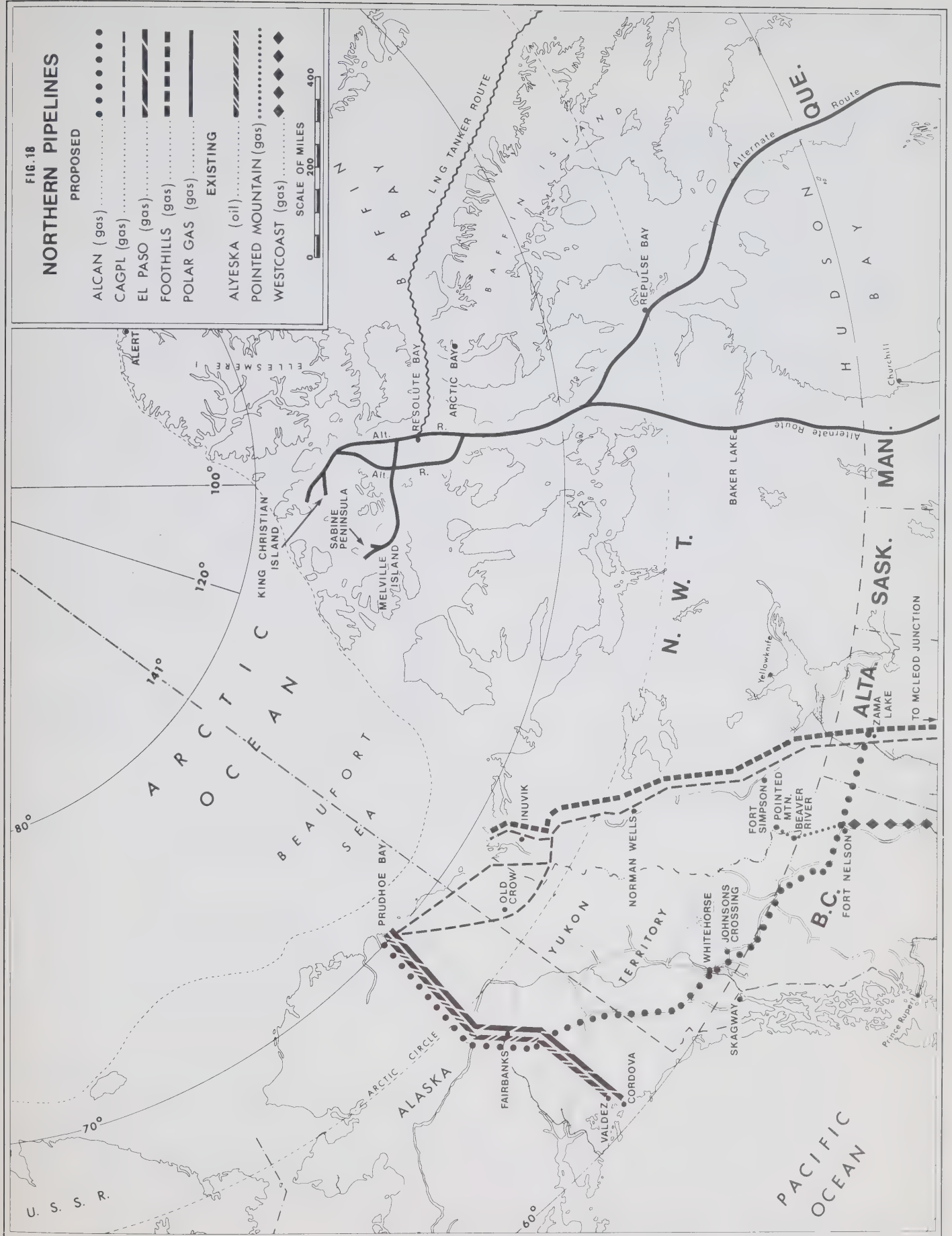
## PROPOSED

- ALCAN (gas) .....
- CAGPL (gas) .....
- EL PASO (gas) .....
- FOOTHILLS (gas) .....
- POLAR GAS (gas) .....

## EXISTING

- ALYESKA (oil) .....
- POINTED MOUNTAIN (gas) .....
- WESTCOAST (gas) .....

SCALE OF MILES



psi. Capacity at commencement would be 1.25 BCFD. In four years the full capacity of 2.25 BCFD would be reached.

### **Alcan Proposal**

The Foothills Pipe Line Ltd. group became involved during 1976 in the Alaska Highway (Alcan) pipeline project, which proposes to move Alaskan gas from Prudhoe Bay through Alaska and the Yukon, and to connect with the existing systems of Westcoast Transmission Company Limited in British Columbia and with the Alberta Gas Trunkline in Alberta for ultimate delivery of gas to United States markets in the Lower 48 states. Applications or supporting submissions by all participants were filed before the Federal Power Commission in the United States and the National Energy Board in Canada in the summer and fall of 1976. The pipeline system proposed by Foothills would consist of approximately 512 miles of 42-inch pipe in the Yukon and approximately 160 miles of 36-inch pipe in Saskatchewan — which would include a short link to the southwest part of the province to connect to the new re-entry points in the United States for delivery of part of the Alaskan gas. The system would follow the trans-Alaska (Alyeska) crude oil pipeline to Fairbanks, and then parallel the Alaska Highway to the Alberta border where it would connect with the Alberta Gas Trunk Line and Westcoast systems.

Estimated costs of the Foothills facilities amount to \$1.3 billion for the Canadian portion, including provision for future escalation, to move 1.25 BCFD of gas in the first year of operation, and 2.4 BCFD by the fifth year.

The Alcan proposal, sponsored by a subsidiary of Northwest Pipeline Corp. of Salt Lake City, is being heard by the United States Federal Power Commission together with the competing applications of Canadian Arctic Gas Pipeline Ltd. and El Paso Co.

### **Polar Gas Project**

The Polar Gas Group was formed in late 1972 with the aim of investigating the feasibility of a natural gas pipeline from the Arctic Islands. The group study areas include ecology, engineering, ice, bathymetry, and aerial photography. Total research cost before filing of applications has been estimated at \$57 million of which \$20 million had already been spent as of June 30, 1975. Subsequent to the filing of application which is expected to be in 1977, and up to the date of permanent financing following certification, costs related to pre-construction engineering activities could amount to a further \$50 million. The pipeline could be constructed in the late 1970's with the first gas deliveries reaching market in the early 1980's.

Three possible routes are being investigated:

- (a) a 48-inch pipeline extending from Drake Point, Melville Island, across Barrow Strait to Somerset Island and Boothia Peninsula through the District of Keewatin to the Manitoba border and then southeast to the markets of southern Ontario and Quebec. The capacity of the line would be 3-4 BCFD and the cost would be approximately \$7.5 billion.
- (b) a 42-inch pipeline following the same route as (a) above as far as the Manitoba border, then south to Winnipeg to connect with the existing Trans-Canada PipeLines system. The capacity of this line would be 2 BCFD and the cost approximately \$4.5 billion.
- (c) a 48-inch pipeline extending southeast from Spence Bay across Southampton, Coats and Mansell islands to the east coast of Hudson Bay and from there to Montreal. The capacity of this line would be 3-4 BCFD and the cost approximately \$9.2 billion.

Proposed and existing northern pipeline routes are shown in Figure 18.

# Production, Processing and Refining

## Gas

Six gas wells in the Pointed Mountain Gas Field, G-62, K-45, O-46, P-53, F-38 and A-55 (in grid area 60-32-123-45) produced gas at a combined gross average rate of 92.1 MMCFD (Million Cubic Feet per Day) plus 704 BWPD (Barrels of Water per Day) for a yearly total of 33.631 BCF (Billion Cubic Feet) and 256,993 barrels of water.

The Beaver River Gas Field straddles the Yukon-British Columbia border with one well, Pan Am Beaver River Y.T. G-01 (in grid area 60-10-124-15) in the Yukon portion of the field. A total of 0.966 BCF was produced from the Mississippian formation in this well during 1976, at an average gross rate of 2.6 MMCFD. Under a royalty-sharing unitized-pool agreement between the British Columbia and the Federal governments, 7 per cent of the total Nahanni formation production, or 0.478 BCF, was assigned to the Yukon portion of the field during the year.

Gas produced from the Pointed Mountain Field is transported via Westcoast Transmission to the Clarke Lake gas plant at Fort Nelson, B.C. Gas from the Beaver River Field, part of which underlies the Yukon, is also transported to the Clarke Lake plant.

A submission was received from Imperial Oil Limited, Gulf Oil Canada Ltd., and Shell Canada Resources Ltd., in November 1974, for approval to develop the gas reserves of the Mackenzie Delta.

Three gas processing plants, with a combined ultimate design capacity of 1.5 BCFD, are proposed for the Niglintgak, Parsons Lake, and Taglu gas fields. Construction would be coincident with that of a Mackenzie Valley pipeline. Preliminary engineering design is progressing on all three plants and is under on-going assessment by INA.

## Oil

The Norman Wells Oil Field, lying in the west central part of the Northwest Territories, had 59 oil wells capable of production in 1976, with 33 producing regularly. Total gross field production during the year averaged 2,751 BOPD (Barrels of Oil per Day) plus 5.2 MMCFD of gas, for a yearly total of 1,004,119 barrels of oil and 1.906 BCF of gas.

The only refinery in Canada located North of 60 is at Norman Wells and is operated by Imperial Oil Limited. It has a calendar day capacity of 3,200 barrels. A continuing modernization program is underway to upgrade the refinery facilities. Construction of a new wharf loading area was completed in 1975 and additional tankage for storage of Bunker C fuels is being installed so that previously flared heavy ends can be marketed. All tankage is now fully dyked, minimizing the threat of oil spills in the area. In 1976, the refinery processed an average of 2,700 barrels per day of locally produced crude oil.



# Participation and Research Projects

The level of participation and research projects was approximately the same as in 1975 with some 30 individual projects being undertaken. Expenditures incurred for these projects qualify for work credits and, when approved, can be applied to permits in designated approved areas. Major programs in these categories in 1976 included:

## **Geophysical Surveys**

Eureka Exploration Ltd. proposed two large reconnaissance seismic projects this past year. The one, a 3,200-mile marine seismic project, was completed in the Baffin Bay-Davis Strait area. The other, a 1,300-mile project in the Beaufort Sea west of Banks Island was only partially completed due to limited ship availability and to weather complications.

Geophysical Service Inc. also conducted two marine seismic programs. An extensive 2,800-mile regional survey was conducted and completed in the Sverdrup Basin (Arctic Islands) and a smaller, more detailed, 1,000-mile project was conducted in the waters off the Mackenzie Delta.

The Sun Oil Company, the operator for the Arctic Islands Offshore Group, commenced seismic operations in the Sverdrup Basin, employing four conventional land seismic crews. During the summer months this program was supplemented with a marine seismic vessel. The whole program is expected to take three years and will cost approximately \$40 million.

## **Geological Surveys**

Geochem Laboratories (Canada) Ltd. commenced work in late 1976, on a participation project that involved core and sample facies analysis and geochemistry, for wells in the Anderson Plain, Peel Plateau, Peel Plain, and Great Bear Plain area. This work will continue into 1977.

Fischbuch Consultants Ltd., have completed an extensive participation study of Paleozoic facies distribution over a large area from the northern Yukon to Ellesmere Island. This study integrates outcrop data with subsurface core, sample and mechanical log data.

## **Research Programs**

Arctic Petroleum Operators Association (APOA) continued its heavy investment of effort and money in environmental and engineering research projects in the Far North. It initiated twelve new projects in 1976, as well as continuing several other studies. The new projects deal mainly with ice mechanics and ice defence systems research. One study is being conducted on polar bears.

APOA continues to have representation on the Advisory Committee for the Arctic Land Use Research program, and has supported projects conducted in the Mackenzie Delta area by the University of Alberta and other Canadian universities.

Exclusive research programs were carried out by several companies in many geographical locations. Imperial Oil Ltd. conducted several environmental baseline studies in the Davis Strait area and some research on ice defence systems in the Beaufort Sea. Pacific Petroleum Ltd. is studying the feasibility of drilling in Norwegian Bay, and Canada Cities Service Ltd. is conducting bottom sampling studies in the Baffin Bay area. Norlands is conducting a major environmental study in the Lancaster Sound area as part of the Department of Indian and Northern Affairs' pre-requisites to submitting an application to drill a well. The results of this study will probably be incorporated into a large-scale environmental study of the eastern Arctic, estimated to cost in excess of \$10 million. It will be co-ordinated by a joint Government-Industry task force under terms being negotiated.

# Appendix I

## Sources of Information Relative to Oil and Gas Activity North of 60°

### Publications

#### A. Maps

Many maps dealing with the northern resource activities are published by the Northern Non-Renewable Resources Branch and are available from the Oil and Gas Exploratory Operations Section, Calgary, Alberta, or from the Director, Northern Non-Renewable Resources Branch, Ottawa. The Branch publishes a list of maps which may be obtained from either of the above sources.

#### B. Reports

The following reports may be obtained from Supply and Services Canada, Printing and Publishing, or the Oil and Gas Exploratory Operations Section, Calgary. Pre-payment is required.

Schedule of Wells 1921-1971	— (out of print)
Schedule of Wells 1972	— \$5.00
Schedule of Wells 1973	— 5.00
Schedule of Wells 1974	— 5.00
Schedule of Wells 1975	— 5.00
Schedule of Wells 1976	— 5.00 (Available only from Supply and Services Canada).

Oil and Gas Statistical Report No. 1 (1920-1960)	— (out of print)
Oil and Gas Statistical Report No. 2 (1921-1972)	— 5.00

"Technical Reports available for Inspection 1975" (Geological and Geophysical Reports released from confidential status are available for public inspection only in the office of the Oil and Gas Exploratory Operations Section of this Department in Calgary) — no charge.

#### Other Sources of Information

Information on northern resources activities can be obtained from the Director, Northern Non-Renewable Resources Branch, Department of Indian and Northern Affairs, 400 Laurier Avenue West, Ottawa. All cores and samples from wells drilled on Canada lands north of 60° N. latitude are stored at the Institute of Sedimentary and Petroleum Geology, 3303-33rd St. N.W., Calgary, Alberta. Samples and cores for wells which have been released from confidential status pursuant to the Canada Oil and Gas Land Regulations and the Canada Oil and Gas Drilling and Production Regulations may be inspected at the Institute. A list of such wells may be obtained from the Director, Northern Non-Renewable Resources Branch.

Specialized and technical literature pertaining to northern Canada may be obtained from the following government agencies:

#### Department of Indian and Northern Affairs

Departmental Library, 400 Laurier Avenue West, Ottawa, Ontario  
(1) Oil and Gas Exploratory Operations Section, Department of Indian and Northern Affairs, Calgary.

#### Department of Energy, Mines and Resources

- (1) Geological Survey of Canada — Ottawa, Ontario and Vancouver, B.C.
- (2) Institute of Sedimentary and Petroleum Geology — Calgary, Alberta
- (3) Atlantic Geoscience Centre, Bedford Institute of Oceanography — Dartmouth, Nova Scotia
- (4) Earth Physics Branch — Ottawa, Ontario

#### Department of National Defence

Defence Research Board, Scientific Information Service — Ottawa, Ontario

#### Transport Canada

- (1) Canadian Coast Guard — Ottawa, Ontario  
Branches — Aids and Waterways  
— Fleet Systems  
— Ship Safety  
— Coast Guard Emergencies  
— Telecommunications and Electronics Branch, Edmonton, Alberta and Ottawa, Ontario.
- (2) Civil Aviation Branch — Winnipeg, Manitoba

**Arctic Institute of North America —**  
Calgary, Alberta

**National Research Council —**  
Ottawa, Ontario

#### Public Libraries

The following brochures published by the *Department of Indian and Northern Affairs* may be available in some public libraries:

- i Guide to Northern Non-Renewable Resources
- ii Communication and Transportation Facilities Queen Elizabeth Group — Arctic Islands
- iii Resource Management Division — Responsibilities and Administration
- iv Oil and Gas Canada Lands — Volume No. 2
- v Oil and Gas Canada Lands — Edition No. 3



- vi Oil and Gas in the Yukon and Northwest Territories — Edition No. 4 — 1967
- vii Oil and Gas — North of 60 — 1968
- viii Oil and Gas — North of 60 — 1969
- ix Oil and Gas — North of 60 — 1970
- x Oil and Gas — North of 60 — 1971
- xi Oil and Gas — North of 60 — 1972
- xii Oil and Gas — North of 60 — 1973
- xiii Oil and Gas — North of 60 — 1974
- xiv Oil and Gas — North of 60 — 1975
- xv Prospectus — North of 60

### **Information and Procedures Concerning Operations on Canada Lands**

Certain federal agencies are concerned with exploration on Canada lands and must be notified prior to the commencement of any exploration activity. The operator or permittee, not the contractor, is responsible for providing the requisite advance notice of planned programs to these agencies by writing directly to them.

For offshore programs, the Regional Director of Northern Operations at Yellowknife, Northwest Territories, in addition to the Northern Non-Renewable Resources Branch, must be informed with respect to each program. He will communicate with every department and agency on a need-to-know basis with respect to Marine Geophysical Programs. In the case of the Hudson Bay region, operators must also inform the National Research Council of Canada of proposed operations to be undertaken during the summer months.

Circumstances may be such that other agencies should be notified as well, and these are listed on the following pages, together with the names of persons who can be of assistance. For example, since operators are responsible for any damage they may cause to underwater commercial cables, it is recommended that they contact the Canadian Hydrographic Service for cable-lay data covering the area over which the work is to be performed. Similarly, the Department of National Revenue, Customs and Excise should be contacted by the importing company if vessels or equipment are to be brought in from abroad.

Information in the brochure "Communications and Transportation Facilities Queen Elizabeth Group, Arctic Islands", is being updated and will be available in a comprehensive report entitled "Operational Guide for Oil and Gas Companies in the North". This publication is now in preparation and should be available by October 1977. In addition to information concerning communications and transportation, the report will contain information covering all aspects of exploration in the North.

### **Department of Indian and Northern Affairs**

Pursuant to Section 52 of the Canada Oil and Gas Land Regulations, "Notice of Commencement of Exploratory Work" must be filed 15 days prior to

commencement of proposed exploratory programs (geophysical, geological and research) on the mainland in the Northwest Territories and Yukon Territory and Arctic Islands, and 45 days prior to commencement of geophysical work on offshore areas, with the Oil and Gas Exploratory Operations Section, Northern Non-Renewable Resources Branch, Department of Indian and Northern Affairs, 112-11th Avenue, S.E., Calgary, Alberta T2G 0X5

Information and assistance may also be obtained from:

Director,  
Northern Non-Renewable Resources Branch,  
Department of Indian and Northern Affairs,  
OTTAWA, Ontario K1A 0H4  
Name: Dr. H.W. Woodward  
Phone: 819-997-9339

or from:

Chief,  
Oil and Gas Lands Division,  
Name: P. Sullivan  
Phone: 819-997-9741

Advice on exploratory programs and operational matters may be obtained from:

Head,  
Oil and Gas Exploratory Operations Section,  
Name: S.A. Kanik  
Phone: 819-997-9444

Drilling authority and advice on drilling matters can be obtained from the District Conservation Engineer for the appropriate District. (See Fig. No. 20 for District boundaries).

*Oil and Gas Engineering Division*  
Chief Petroleum Engineer — Appointment pending  
Head, Drilling and Completion  
Engineering Section — M.K. El-Defrawy  
Head, Offshore Petroleum  
Engineering Section — L. Franklin  
Head, Production Systems  
Engineering Section — R.L. Price  
Head, Reservoir Engineering  
Section — T.M. Baker  
Head, Pipelines Engineering  
Section — R.E. Jackson  
Scientific Research and Special  
Projects Co-ordinator — I.M. Feldman  
Regional Oil and Gas  
Conservation Engineer, — M.D. Thomas in  
N.W.T. Yellowknife  
Regional Oil and Gas  
Conservation Engineer, — A.F. Halcrow  
Y.T. Whitehorse  
District Oil and Gas  
Conservation Engineers — B.N. Berry  
for Arctic Islands



(Conservation Eng. Cont'd.)

- in Yellowknife,  
District 1, N.W.T.
- Appointment Pending  
for Southern Sector,  
(South of 67°)  
N.W.T. in Yellowknife,  
District 2, N.W.T.
- D.R. Whitehead for the  
Northern Sector (North  
of 67° & Beaufort Sea)  
N.W.T. in Inuvik,  
District 3, N.W.T.

A Land Use Permit must be acquired for every land use operation including drilling operations. Advance notice of 90 days is required before the start of drilling operations and all seismic activities, including marine seismic surveys involving the use of high explosives, in the event that qualified observers are needed. Notice of 45 days to the Regional Director is also required before the start of a seismic survey in which a source of acoustical energy other than high explosives is to be used.

Information and advice on the Land Use Regulations and Land Use Permits can be obtained:

For the Northwest Territories:

A/Regional Director of Northern Operations,  
P.O. Box 1500,  
YELLOWKNIFE, N.W.T.  
X0E 1H0  
Name: R. Hornal Phone: 408-873-4421

For the Yukon Territory:

Regional Director of Northern Operations,  
200 Range Road,  
WHITEHORSE, Y.T.  
Y1A 3V1  
Name: B.J. Trevor Phone: 403-668-5151

**Department of Energy, Mines and Resources  
Resource Management and Conservation Branch**

The Resource Management and Conservation Branch is responsible for the administration of federal interest in the mineral resources off Canada's east and west seacoasts and in the Hudson Bay and Hudson Strait regions.

As a general rule all correspondence should be addressed to:

Dr. D.G. Crosby,  
Director,  
Resource Management and Conservation Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario  
K1A 0E4

The Branch may be reached by:

Telephone: (613) 995-9351  
Telex: 053-4366  
Telecopier: 996-5707

*The Mineral Rights Division of the Branch*, through the issuance of exploration permits and production leases, makes available rights to mineral development on all Canada lands in the Offshore excluding the High Arctic; and ensures that holders of such terminable grants fulfill the terms and obligations stipulated in the Regulations in order to maintain their interests in good standing.

Advice and assistance on matters relating to the disposition and administration of mineral rights, such as the issuance and terms of permit and leases and expenditures allowable for credit against permit or lease work obligations, may be obtained from:

D.L. Tough,  
Chief,  
Mineral Rights Division,  
Resource Management and Conservation Branch,  
OTTAWA, Ontario K1A 0E4

*The Resource Geology Division of the Branch* evaluates geological and geophysical information submitted by offshore operators, and assesses the mineral resource potential of prospects and specific areas in Canada's offshore regions, as well as for federally-owned mineral rights in the Provinces, for resource management purposes. The Division is also responsible for the handling and curation of lithologic and paleontologic material from offshore wells, and for the assembly and maintenance of a data bank of geological and geophysical information from the offshore.

Requirements and procedures with regard to the submission, confidentiality and subsequent examination of geophysical and geological data, including well materials, as well as sources of geological information and related matters, may be obtained from the office of:

D.F. Sherwin,  
Chief,  
Resource Geology Division,  
Resource Management and Conservation Branch,  
OTTAWA, Ontario K1A 0E4

Assistance on such operational matters as the drilling, testing, completion or plugging of offshore wells; offshore structures; geophysical surveys; reporting requirements; pollution contingency plans; offshore environmental and feasibility projects; and the availability of reports after their release from confidential status may be obtained from the office of:

G.R. Yungblut,  
Chief,  
Operations and Conservation Division,  
Resource Management and Conservation Branch,  
OTTAWA, Ontario K1A 0E4

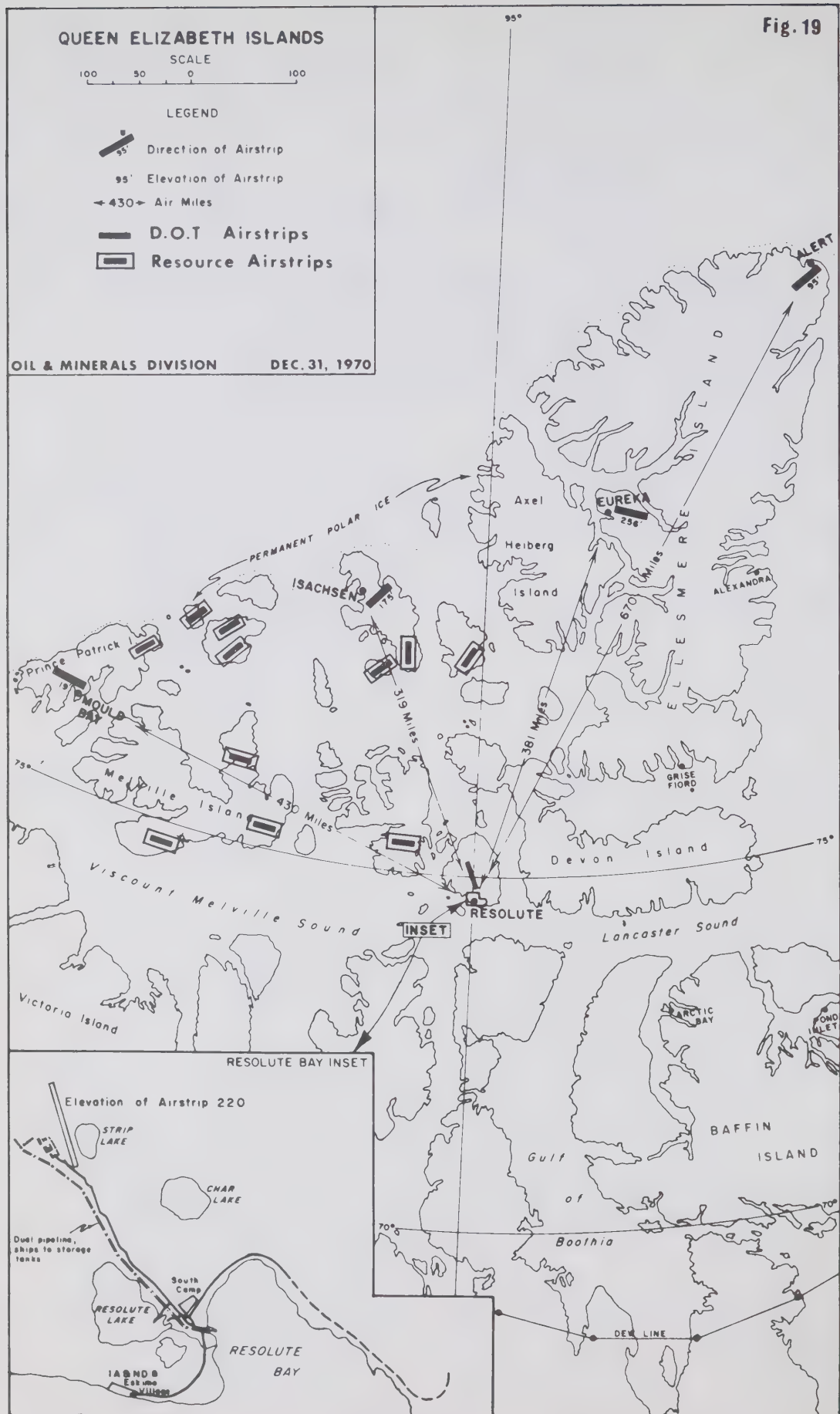
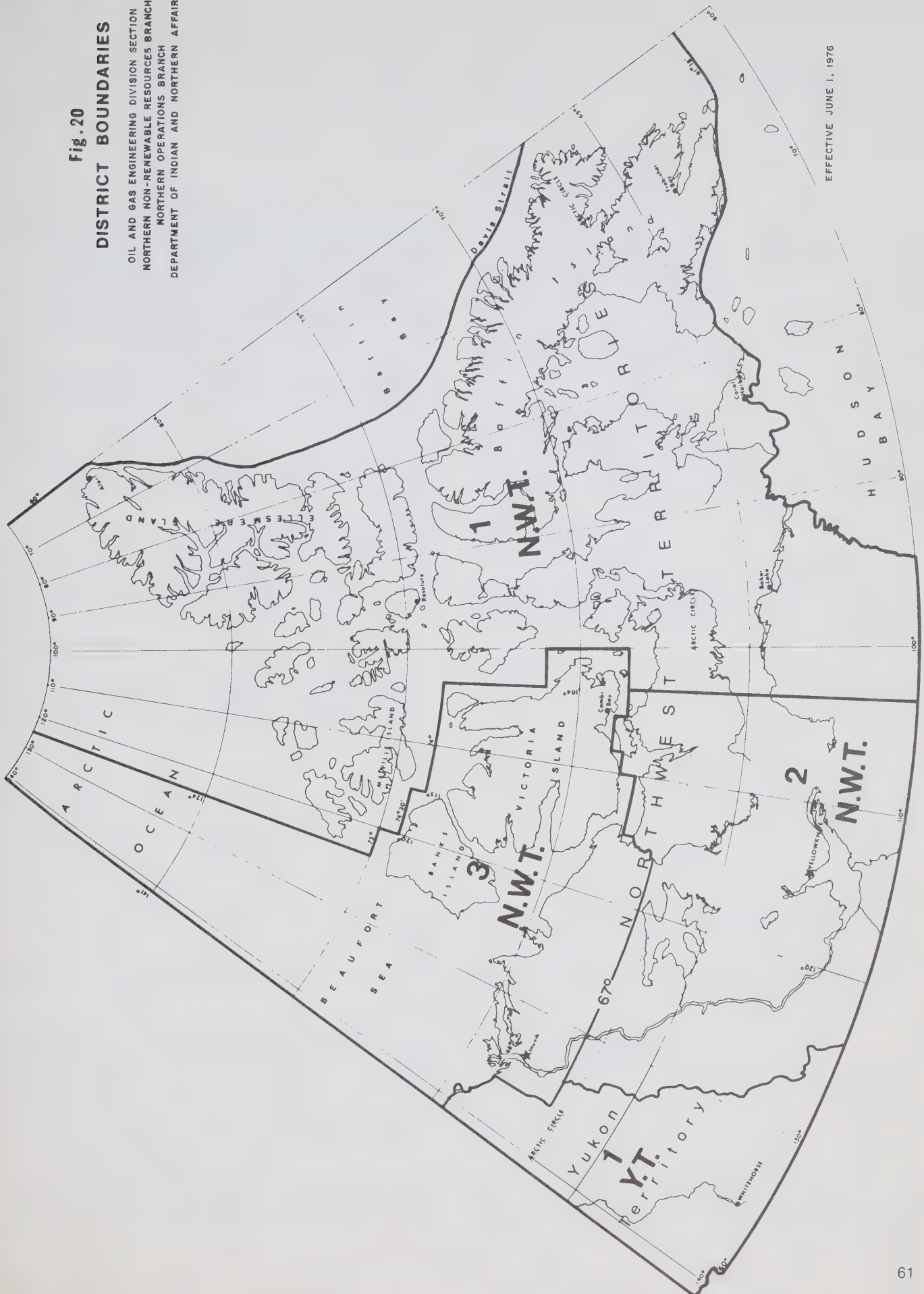


Fig. 20

# DISTRICT BOUNDARIES

OIL AND GAS ENGINEERING DIVISION SECTION  
NORTHERN NON-RENEWABLE RESOURCES BRANCH  
NORTHERN OPERATIONS BRANCH  
DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS



EFFECTIVE JUNE 1, 1976



## *Surveys and Mapping Branch*

Information on the systems, methods and equipment utilized for positioning and surveying with respect to exploration work may be subject to review by this agency. Moreover, legal surveys must be made in accordance with instructions of the Surveyor General.

Inquiries concerning surveying may be directed to:

Surveyor General and Director,  
Legal Surveys Division, Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E9  
Name: D.R. Slessor  
Phone: 613-994-9174

Information concerning control surveys may be obtained from:

Geodetic Survey Division,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E9  
Name: C.E. Hoganson  
Phone: 613-994-5079

When requesting control survey data, the inquiries should define the area involved by latitude and by longitude, and should indicate that the data are required for surveys relating to oil and gas exploration.

Air photographs covering all portions of Canada may be obtained from:

National Air Photo Library,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E9  
Attention: P. Andrews  
Phone: 613-994-5457

and

Publications and Air Photo Section,  
Institute of Sedimentary and Petroleum Geology,  
3303-33rd Street, N.W.,  
CALGARY, Alberta T2L 2A7  
Attention: Mrs. D. Cormier  
Phone: 403-284-0110

Topographic maps, indices charts atlases and numerous other map publications may be obtained from:

Canada Map Office,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E9  
Attention: G.A. Clemmer  
Phone: 613-994-9663

and

Publications and Air Photo Section,  
Institute of Sedimentary and Petroleum Geology,  
3303-33rd Street, N.W.,  
CALGARY, Alberta  
T2L 2A7  
Attention: M.H. Brooks  
Phone: 403-284-0110

## ***Geological Survey of Canada***

The Geological Survey of Canada carries out systematic geological and geophysical surveys in the sedimentary basins of Canada, including parts of the regions offshore from the east and west coasts, in Hudson Bay, and in the Arctic Islands.

Inquiries with regard to the operations and publications of the Geological Survey should be made to:

Director-General,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario  
K1A 0E8  
Name: D.J. McLaren  
Phone: 613-994-5817

or to:

Director,  
Institute of Sedimentary and Petroleum Geology,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
CALGARY, Alberta T2L 2A7  
Name: D.F. Stott  
Phone: 403-284-0110

or to:

Director,  
Atlantic Geoscience Centre,  
Department of Energy, Mines and Resources,  
P.O. Box 1006,  
DARTMOUTH, Nova Scotia  
B2Y 4A2  
Name: B.D. Loncarevic  
Phone: 902-426-2367

## ***Polar Continental Shelf Project***

The Polar Continental Shelf Project is a continuing investigation of the continental shelf fringing the Arctic coast of Canada, together with adjacent parts of the Arctic Ocean basin, the islands of the Canadian Arctic Archipelago and the intervening waters, and other areas of special interest.

Inquiries regarding surveys and scientific studies in Arctic areas may be directed to:

Director,  
Polar Continental Shelf Project,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario  
K1A 0E4  
Name: G. Hobson  
Phone: 613-996-3388

### ***Earth Physics Branch***

The Earth Physics Branch operates a network of Arctic geophysical observatories and carries out systematic geophysical surveys and studies throughout Canada including the Arctic.

Inquiries with regard to the scientific studies, surveys and publications of the Earth Physics Branch should be directed to:

Director-General,  
Earth Physics Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario  
K1A 0Y3  
Name: K. Whitham  
Phone: 613-994-5253

### **Department of Fisheries and the Environment**

#### ***Environmental Protection Service***

This agency is advised on a need-to-know basis by the Regional Director of Resources, Department of Indian and Northern Affairs, of any drilling operations and all seismic activities, including marine seismic surveys involving the use of high explosives in the event that qualified observers are needed. Information regarding the Department's requirement can be obtained from:

Assistant Deputy Minister  
Environmental Protection Service  
Department of Fisheries and the Environment  
15th Floor, Place Vincent Massey  
OTTAWA, Ontario  
K1A 0H3  
Name: Mr. L. Edgeworth  
Phone: 819-997-1575 or 997-1576

#### ***Fisheries and Marine Service***

##### ***Fisheries Management***

Information on the following fisheries matters may be obtained from:

Yukon freshwater and marine fish:

Director-General  
Fisheries Management  
Fisheries and Marine Service  
Department of Fisheries and the Environment  
1090 West Pender Street  
VANCOUVER, British Columbia  
V6E 2P1

Name: Dr. G. Geen  
Phone: 604-666-6097

Northwest Territories freshwater fish, including Arctic char:

Director-General  
Fisheries Management  
Fisheries and Marine Service  
Department of Fisheries and the Environment  
Freshwater Institute  
501 University Crescent  
WINNIPEG, Manitoba  
R3T 2N6  
Name: Dr. G.H. Lawler  
Phone: 204-269-7379

Northwest Territories marine fish and marine mammals (including Hudson Bay):

Director  
Arctic Biological Station  
Fisheries and Marine Service  
Department of Fisheries and the Environment  
STE. ANNE DE BELLEVUE, Québec  
H9X 3L6  
Name: Dr. A. Mansfield  
Phone: 514-457-3660

General information on environmental assessment studies and research relating to contaminants in freshwater and marine waters of the Arctic:

Director  
Aquatic Environment Branch  
Fisheries and Marine Service  
Department of Fisheries and the Environment  
580 Booth Street  
OTTAWA, Ontario  
K1A 0H3  
Name: Dr. J. C. MacLeod  
Phone: 613-995-2205

### ***Ocean and Aquatic Sciences***

The Canadian Hydrographic Service publishes charts of Canadian navigable waters.

General information concerning charts may be obtained from:

Canadian Hydrographic Service  
Department of Fisheries and the Environment  
615 Booth Street  
OTTAWA, Ontario  
K1A 0H3  
Name: Mr. L.P. Murdoch  
Phone: 613-994-5377

Information concerning charts showing Canada's Territorial Sea and Fishing Zone Limits and related data may be obtained from:

Canadian Hydrographic Service  
Department of Fisheries and the Environment  
615 Booth Street  
OTTAWA, Ontario  
K1A 0H3  
Name: Mr. E.J. Cooper  
Phone: 613-994-9330

Commercial Cable-lay data may be obtained from:

Canadian Hydrographic Service  
Department of Fisheries and the Environment  
OTTAWA, Ontario  
K1A 0H3  
Name: Mr. J. Bruce  
Phone: 613-994-5141

Information on tides may be obtained from:

Tides, Currents and Water Levels  
Canadian Hydrographic Service  
Department of Fisheries and the Environment  
615 Booth Street  
OTTAWA, Ontario  
K1A 0H3  
Name: Dr. W.F. Forrester  
Phone: 613-994-9146

Information on hydrographic surveys and control data in the Eastern Arctic may be obtained from:

Regional Hydrographer  
Canadian Hydrographic Service  
Atlantic Oceanography Laboratory  
Department of Fisheries  
and the Environment  
Bedford Institute of Oceanography  
DARTMOUTH, Nova Scotia B2Y 4A2  
Name: Mr. R.C. Melanson  
Phone: 902-426-3497

Information on hydrographic surveys and control data in the western Arctic may be obtained from:

Regional Hydrographer  
Canadian Hydrographic Service  
Ocean and Aquatic Sciences  
Department of Fisheries and the Environment  
512 Federal Building  
VICTORIA, B.C.  
V8W 1Y4  
Name: Mr. M. Bolton  
Phone: 604-388-3188

*Physical and Chemical Oceanography.* Information on the following matters may be obtained from:

*Western Arctic* (Beaufort Sea) and Sverdrup Basin:

Director-General  
Ocean and Aquatic Sciences  
Fisheries and Marine Service  
Department of Fisheries and the Environment  
512 Federal Building  
VICTORIA, B.C.  
V8W 1Y4  
Name: Dr. R.W. Stewart  
Phone: 604-566-3383

*Eastern Arctic* (Baffin Bay and Davis Strait):

Director-General  
Ocean and Aquatic Sciences  
Fisheries and Marine Service  
Department of Fisheries and the Environment  
Bedford Institute of Oceanography  
DARTMOUTH, N.S.  
B2Y 4A2  
Name: Dr. W.L. Ford  
Phone: 902-426-3492

*Central Arctic* (including Hudson Bay and James Bay):

Director-General  
Fisheries and Marine Service  
Canada Centre for Inland Waters  
Department of Fisheries and the Environment  
P.O. Box 5050  
BURLINGTON, Ontario  
L7R 4A6  
Name: Mr. M.G. Johnson  
Phone: 416-637-4673

*Data* on physical-chemical oceanography, tidal predictions, wave climate, etc.:

Director  
Marine Environmental Data Service  
Ocean and Aquatic Sciences  
Fisheries and Marine Service  
Department of Fisheries and the Environment  
580 Booth Street  
OTTAWA, Ontario  
K1A 0H3  
Name: Dr. J.R. Wilson  
Phone: 613-995-2007

*General information* on oceanographic activities in the Arctic:

Director-General  
Marine Sciences and Information Directorate  
Ocean and Aquatic Sciences  
Fisheries and Marine Service  
Department of Fisheries and the Environment  
580 Booth Street  
OTTAWA, Ontario  
K1A 0H3  
Name: Dr. N.J. Campbell  
Phone: 613-995-2039



### **Environmental Management Service**

Information concerning wildlife, such as the locations of migratory bird sanctuaries and National Wildlife Areas, and the Arctic Ecology Maps Series that show important and critical wildlife areas of the Canadian Arctic where human activities can have adverse or destructive impact on wildlife population may be obtained from:

Director-General  
Canadian Wildlife Service  
Department of Fisheries and the Environment  
16th Floor, Place Vincent Massey  
OTTAWA, Ontario  
K1A 0H3  
Name: Mr. N.G. Perret  
Phone: 819-997-1360

Information concerning research into oil spills in icy waters; stream flow; water levels and quality; permafrost hydrology; flood forecasting; river basin planning; sediment surveys; ice studies; and water demand, supply, use, diversion and conservation; and environmental impact assessment, may be obtained from:

Inland Waters Directorate  
Environmental Management Service  
Department of Fisheries and the Environment  
6th Floor, Place Vincent Massey  
OTTAWA, Ontario  
K1A 0H3  
Phone: 819-997-3119

Information concerning northern forests and vegetation; their mapping; growth; relationship to terrain, soils and landscapes; and stability, may be obtained from:

Director-General  
Canadian Forestry Service  
Department of Fisheries and the Environment  
19th Floor, Place Vincent Massey  
OTTAWA, Ontario  
K1A 0H3  
Name: Dr. R.J. Bouchier  
Phone: 819-997-1454  
or  
Director  
Forest Management Institute  
Canadian Forestry Service  
Department of Fisheries and the Environment  
396 Cooper Street  
OTTAWA, Ontario  
K1A 0H3  
Name: Dr. L. Sayn-Wittgenstein  
Phone: 613-996-1674

or  
Director  
Northern Forest Research Centre  
Canadian Forestry Service  
Department of Fisheries and the Environment  
5320 — 122 Street  
EDMONTON, Alberta  
T6H 3S5

Name: Dr. G.T. Silver  
Phone: 403-435-7210

or  
Director  
Pacific Forest Research Centre  
Canadian Forestry Service  
Department of Fisheries and the Environment  
506 West Burnside Road  
VICTORIA, B.C.  
V8Z 1M5

Name: Mr. H. Drinkwater  
Phone: 604-388-3811

The map series, entitled Land Use Information Series (for northern Canada), provides extensive data on renewable resources and related human activities. Coverage now includes all of the Yukon territory, the Mackenzie Valley and the Great Slave Lake region. Enquiries for obtaining this map series may be directed to:

Canada Map Office  
Department of Energy, Mines and Resources  
130 Bentley Avenue  
Ottawa, Ontario  
K1A 0E9  
Phone: 613-994-9663

Further information on the series may be obtained from:

Lands Directorate  
Department of Fisheries and the Environment  
20th Floor, Place Vincent Massey  
OTTAWA, Ontario  
K1A 0H3  
Name: Mr. K. Taylor  
Phone: 819-997-2240

### ***Atmospheric Environment Service***

Requests for information and assistance on meteorological and sea-ice data, climatology, weather forecasting, meteorological instruments and research may be directed to:

A/Assistant Deputy Minister  
Atmospheric Environment Service  
Department of Fisheries and the Environment  
4905 Dufferin Street  
DOWNSVIEW, Ontario  
M3H 5T4  
Name: Dr. W.L. Godson  
Phone: 416-667-4760

Information may also be obtained through the Meteorological Liaison Officer in Ottawa. This position is filled on a rotation basis and the name of the officer is subject to change.

Inquiries in Ottawa may be directed to:

Liaison Meteorologist  
Department of Fisheries and the Environment  
13th Floor, Fontaine Building  
OTTAWA, Ontario  
K1A 0H3  
Name: D.J. Wright  
Phone: 819-997-1588

### ***Environmental Assessment Panel***

Under the federal Environmental Assessment and Review Process, projects with potentially significant environmental effects are referred to the Panel by other federal departments and agencies for review. Projects concerned are those initiated by federal departments and agencies or involving federal funds and property. Further information may be obtained from:

Chairman  
Environmental Assessment Panel  
Department of Fisheries and the Environment  
13th Floor, Fontaine Building  
OTTAWA, Ontario  
K1A 0H3  
Name: Mr. F.G. Hurtubise  
Phone: 819-997-3426

### **Department of National Defence**

#### ***Maritime Command***

The appropriate office of Maritime Command will be advised on the need-to-know basis by the Regional Director of Resources of any exploration program proposed for the offshore.

Operations in Baffin Bay and Arctic waters east of longitude 105° West are handled by the office of:

Commander Maritime Command,  
Department of National Defence,  
F.M.O. HMC Dockyard,  
HALIFAX, Nova Scotia

Operations in Arctic waters west of longitude 105° W are handled by the office of:

Commander Maritime Forces Pacific,  
Department of National Defence,  
F.M.O. HMC Dockyard,  
VICTORIA, B.C.

#### ***Search and Rescue***

The Department of National Defence is responsible for the co-ordination of search and rescue (SAR) operations in Canada. The overall Canadian area of responsibility is divided into four SAR areas as listed below:

#### ***Edmonton SAR***

This area includes the three Prairie provinces, all of the Northwest Territories Mainland and Arctic Islands, the western half of Hudson Bay, and Baffin Island north of 70° N.

The contact is:

Edmonton Search and Rescue Region  
Phone: 403-973-8402

#### ***Victoria SAR***

This area includes British Columbia, Canadian waters off the west coast, the Yukon Territory and the Beaufort Sea south of 70° N and west of 135° W.

The contact is:

Victoria Search and Rescue Region  
Phone: Victoria — 604-388-1543  
Vancouver — 604-732-4141

#### ***Halifax SAR***

This area includes Quebec east of 70° W, the Maritime Provinces, Labrador, Canadian waters off the East Coast, Foxe Basin, Hudson Strait and Baffin Island south of 70° N.

The contact is:

Halifax Search and Rescue Region  
Phone: 902-426-4730  
902-426-4735

### **Trenton SAR**

This area includes all Ontario, Quebec west of 70° W, eastern Hudson Bay and James Bay.

The contact is:

Trenton Search and Rescue Region  
Phone: 613-392-2811 Locals 3870, 3875

Any of the following may also be contacted in case of emergencies: Air Traffic Control Centres, airport control towers, radio stations, marine radio stations, RCMP detachments, provincial and municipal police stations.

The following information is required when making an "Alert Report":

- a. Name of caller, phone number, and official connection, e.g., RCMP detachment commander, aircraft owner, etc.
- b. Assistance required;
- c. Description of aircraft, boat, or whatever craft is involved;
- d. Full details as to the nature of distress or emergency.

### **Search and Rescue (Marine)**

In addition to the above, the Fleet Systems Branch, Canadian Coast Guard, Transport Canada, has responsibility to provide vessels for marine search and rescue operations. Contacts may be made at the above locations as well as at any Canadian Coast Guard office or marine radio stations.

### **Transport Canada**

#### **Aids and Waterways Branch — Marine Aids Division**

At least 60 days' notice is required by this Division before the commencement of any offshore exploration program in order that appropriate local Notices to Shipping and national Notices to Mariners may be issued. These Notices are subsequently copied into related foreign publications.

The Division also indicates the requirement of any aids to navigation devices that may be necessary for the program.

Advance notice of 90 days is required in any case where drilling involves the territorial sea, in order for approval to be granted under the Navigable Waters Protection Act.

All communications on these matters should be directed to:

Chief,  
Marine Aids Division,  
Aids and Waterways Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario K1A 0N7  
Phone: 613-992-2736

In addition, there are a number of Departmental officers who may be contacted in the field should the need arise. Their titles and addresses are given below:

- (i) District Manager,  
Canadian Coast Guard,  
Transport Canada,  
101 Boulevard Champlain  
QUEBEC, Quebec  
G1K 4H9  
Phone: 418-694-3420  
(This office handles the Hudson Bay Area)
- (ii) District Manager,  
Canadian Coast Guard,  
Transport Canada,  
P.O. Box 5002,  
HAY RIVER, N.W.T.  
X0E 0R0  
Phone: 403-874-2406

### **Fleet Systems Branch**

This Branch has major responsibilities in two areas of concern in offshore operations: support of shipping in ice-congested waters, and marine search and rescue.

If operations are being contemplated for areas where ice may be a problem and where ice-breaker or other support may be desired, there should be consultation with the Director, Fleet Systems, as long in advance as possible. This is particularly important in the case of Arctic and Hudson Bay operations where the planning of ice-breaker disposition is usually made six months in advance of the navigation season.

Further information and assistance may be obtained from:

A/Director,  
Fleet Systems Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario  
K1A 0N7  
Name: R.G.A. Lawrence  
Phone: 613-992-4209

### **Ship Safety Branch**

This Branch includes the Steamship Inspection Division and the Nautical Division. The responsibilities of the Steamship Inspection Division include inspection and certification of ships under the



*Canada Shipping Act and the Arctic Waters Pollution Prevention Act.* This Division also deals with ship safety and pollution matters arising from ship operations, and the application of the Arctic Shipping Pollution Prevention Regulations.

The Nautical Division deals with ship registry, marine personnel and navigation safety matters. At least 60 days notice is required by this Division when drilling operations are planned for areas lying in or near charted ship routes so any necessary authority may be issued.

Further information and assistance may be obtained from:

Director,  
Ship Safety Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario  
K1A 0N7  
Name: G.W.R. Graves  
Phone: 613-992-8892

#### ***Canadian Coast Guard Emergencies***

This office is responsible for the marine contingency planning function of the Department of Transport and also supplies co-ordination and assistance when a federal response is made to combat a spill of oil or toxic materials into the marine environment. The response is made under the Interim Federal Contingency Plan, or in the case in international boundary waters, the appropriate Joint International Plan.

Further information and assistance may be obtained from:

Coast Guard Emergencies,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario  
K1A 0N7  
Name: M.S. Greenham  
Phone: 613-992-9743 or 992-9210

#### ***Coast Guard Casualty Investigations***

This office is responsible for marine accidents investigations, enquiries, and salvage. Further information and assistance may be obtained from:

Chief,  
Coast Guard Casualty Investigations,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario  
K1A 0N7  
Name: Capt. W.A.W. Catinus  
Phone: 613-992-4930 or 996-3808

#### **Department of Communications**

The responsibilities of this agency include the development of technical standards, the selection and co-ordination of radio frequencies, and the licensing of all classes of radio station except broadcasting.

An operator contemplating the use of radio-communications in his offshore activities should make application for licensing of any radio station in Canada or on board any Canadian vessel involved at least six weeks before the proposed in-service date of the communication facility. Details as to the licensing requirements and the necessary application forms may be obtained from the following addresses:

*In Ottawa:*

Director,  
Operations  
Telecommunication Regulatory Service,  
Department of Communications,  
300 Slater Street,  
OTTAWA, Ontario  
K1A 0C8  
Phone: 613-992-8061

Companies in *Western Canada* may contact:

Regional Director,  
Pacific Region,  
Department of Communications,  
325 Granville Street, Room 300,  
VANCOUVER, B.C.  
V6C 1S5  
Phone: 604-666-6580

Regional Director, Central Region,  
Department of Communications,  
2300 — One Lombard Place,  
WINNIPEG, Manitoba  
R3B 2Z8  
Phone: 204-985-4081

District Manager,  
Department of Communications,  
205 — 8th Avenue, S.E., Room 803,  
CALGARY, Alberta  
T2G 0K9  
Phone: 403-231-4201

District Manager,  
Department of Communications,  
400 Baker Center,  
10025 — 106th Street,  
EDMONTON, Alberta  
T5J 1G6  
Phone: 403-425-5089

Companies in *Northern Canada* may contact:

District Manager,  
Department of Communications,  
P.O. Box 540,  
FORT SMITH, N.W.T.  
X0E 0P0  
Phone: 403-872-2187

District Manager,  
Department of Communications,  
Polaris Building,  
201 — 4133, 4th Avenue,  
WHITEHORSE, Y.T.  
Y1A 1H8  
Phone: 403-667-7197

Companies in *Eastern Canada* may contact:

Regional Director,  
Department of Communications,  
7th Floor,  
Terminal Plaza Building,  
1222 Main Street,  
MONCTON, N.B.  
Phone: 506-858-2213

The Winnipeg and Edmonton offices of the Department of Manpower and Immigration can answer any queries regarding entry into the Northwest Territories. The Vancouver office can respond to queries for entry into the Yukon Territory.

## **National Research Council of Canada**

### ***Space Research Facilities Branch***

Operators planning offshore activities in the Hudson Bay region must inform the following agency of the National Research Council well in advance since rockets are fired on a year-round basis from the Churchill Research Range:

Head,  
Range Section,  
Space Research Facilities Branch,  
National Research Council of Canada,  
OTTAWA, Ontario  
K1A 0R6  
Name: Z.R. Charko  
Phone: 613-993-9385

Operators active in the Hudson Bay region are also required to co-ordinate their field activities with:

Superintendent,  
Churchill Research Range,  
National Research Council of Canada,  
CHURCHILL, Manitoba  
R0B 0E0  
Name: C.R. Barrett  
Phone: 204-856-3010

Rockets are also launched from time to time from the facilities at Resolute Bay, N.W.T., and Cape Parry, N.W.T. Operators with exploration work planned for this vicinity are urged to co-ordinate their activities with the National Research Council.

## **Department of National Revenue**

### ***Customs and Excise***

The Headquarters Operations Directorate administers that portion of the Canada Shipping Act that relates to the coasting trade. In this connection, any company importing ships or specialized plants and equipment for exploration work on Canada's sea-coasts and among the Arctic Islands may obtain information, assistance and such other contacts as may be necessary in Customs and Excise from:

Director,  
Operational Systems and Controls,  
Customs and Excise,  
Department of National Revenue,  
OTTAWA, Ontario  
K1A 0L5  
Name: M.D. Greene  
Phone: 992-0693

## **Department of Manpower and Immigration**

### ***Canada Immigration Division***

Inquiries should be directed to:

Chief,  
Non-Immigrant Control and Special Cases Section,  
Facilitation, Enforcement and Control Branch,  
Canada Immigration Division,  
Department of Manpower and Immigration,  
OTTAWA, Ontario  
Name: G.P. Garvin  
Phone: 613-992-0454

The Winnipeg and Edmonton offices of the Department of Manpower and Immigration can answer any queries regarding entry into the Northwest Territories. The Vancouver office can respond to queries for entry into the Yukon Territory.

At Tuktoyaktuk, a local R.C.M.P. officer is also a representative for Manpower and Immigration and can clear entry into Canada via Tuktoyaktuk. At Inuvik, the Customs Officer is also Departmental representative for Manpower and Immigration and can be contacted by telephone if prior arrangements are necessary. There is no representative at Aklavik; in the event that a seismic crew prefers to land at Aklavik, arrangements must be made with the Inuvik representative.

### ***Importation and Operation of Foreign Vessels***

The importation and operation of vessels coastwise or between Canadian and foreign ports are subject to the Customs Act, the Canada Shipping Act, and Coastwise and Foreign Shipping Regulations and the Customs Tariff. These acts and regulations, *Inter Alia*, are administered by the Customs and Excise Branch of the Department of National Revenue.

A company wishing to import ships or specialized plant and equipment for exploration work off Canada's seacoasts is requested to make application well in advance of the proposed commencement date of any programme. In order to ensure that the application is processed properly, this department should be advised at least ninety days before the commencement of the programme. This lead time of ninety days is needed to determine the suitability of Canadian-flag vessels declared available to fulfill the purposes respecting which temporary entry is sought.

Each application must state the area of operation and the approximate time span, and contain a description of the salient features of the energy source equipment proposed for the particular operation. Information should also be supplied in respect of all other essential criteria required, including bunker and stores capacity, accommodation, clear deck space, size of instrumentation room, electrical energy additional to vessel's normal operation needs and possible draft restrictions.

Any additional information, assistance and other contacts as may be necessary in Customs and Excise may be obtained from:

Director,  
Port Administration Division,  
Department of National Revenue,  
Customs and Excise,  
OTTAWA, Ontario  
K1A 0L5  
Attention: Marine Rail Transportation  
Tel. 992-2742



## Appendix II

### To All Permittees and Lessees

#### ***Expenditures Relating to Processing and Interpretation of Geophysical Data Acquired on Canada Lands***

An information letter was recently distributed to all Permittees and Lessees advising operators that as from January 1, 1974, expenditures incurred in computer processing and the interpretation of Geophysical Data acquired in the course of exploration activities involving Canada Lands will not be considered eligible for approval as allowable expenditures unless such processing and interpretation has been carried out in Canada.

After January 1, 1974, an operator submitting a claim, pursuant to the *Canada Oil and Gas Land Regulations*, for allowable expenditures involving geophysical operations undertaken on Canada Lands must identify on his statement of expenditure the name of the company or companies involved together with the location of: (a) the computer facilities utilized in the processing of the geophysical data; and (b) the offices wherein interpretation of the geophysical data was undertaken. Expenditures incurred for computer processing must be separately identified and not included as part of the costs incurred for interpretation.

Further in this regard, the processing of geophysical data undertaken on board non-Canadian seismic ships will be considered to be work undertaken outside Canada and not eligible for approval as allowable expenditures.

Director,  
Resource Management  
and Conservation  
Branch,  
Department of Energy,  
Mines and Resources.

Director,  
Northern Non-Renewable  
Resources Division,  
Department of Indian  
Affairs and Northern  
Development.

#### ***Transfer of Interest — Canada Lands***

The *Canada Oil and Gas Land Regulations* stipulate that no transfer of an oil and gas permit or lease shall pass any interest in a permit or lease until the transfer is registered in accordance with the Regulations, which registration must be approved by the Chief. Please be advised that in future one of the considerations for the approval of the registration of a transfer of any interest in a permit or lease will be that all agreements or an executive summary relating to such transfer of interest have been deposited with the Chief.

All permittees are requested, therefore, to arrange to forward a copy of each current agreement, or an executive summary, to the federal agency concerned at their earliest convenience. In future such agreements should be deposited with the Chief of the appropriate federal agency at the time they are made.

The confidentiality of documents relating to these agreements will of course be maintained until permission to release them is given by the Companies involved.

Director, Resource Management and Conservation Branch.	Director, Northern Non-Renewable Resources Division.
--	--

# Appendix III

## Reporting Forms

The Northern Non-Renewable Resources Branch is a member of the "Federal Provincial Committee on Energy Statistics" and the "Mines Ministers Subcommittee on Oil and Gas Statistics" and together with the four western provinces and Statistics Canada has standardized all its oil and gas reporting forms. This standardization has removed duplication between government agencies and more important, industry can now process all oil and gas reporting forms from the western provinces and the Yukon and Northwest territories on computer machines without change of programs.

<b>Form No.</b>	<b>Title of Form</b>
IAN*52-90-1**	Application for a Drilling Authority
IAN*52-90-2	Well Completion Data
IAN*52-90-3**	Application to Amend a Drilling Authority
IAN*52-90-4**	Application to Change a Well Name
IAN*52-90-5**	Application to Abandon a Well or Suspend Drilling
IAN*52-90-6**	Application to Alter Condition of a Well
IAN*52-90-7	Work-over Report No.
IAN*52-90-8	Application to Commingle Production before Measurement
IAN*52-90-9	Data for Back Pressure Test on Natural Gas Wells-Monograph 7 Method
IAN*52-90-10	Data for Back Pressure Test on Natural Gas Wells-Vitter's Method
IAN*52-90-11	M.P.R. — Oil Calculations
IAN*52-90-12	New Oil Well Report
IAN*52-90-13	New Gas Well Report
IAN*52-90-17	New Service Well Report
IAN*52-90-18	Monthly Water Flood Operations Report
IAN*52-90-20	Monthly Water Receipts and Disposal of Fluids Report
IAN*52-90-23	Geologic Surface Survey & Airphoto Analysis — Expenditures
IAN*52-90*24	Land Geophysical Operations — Expenditures
IAN*52-90-25	Marine Geophysical Programs — Expenditures
IAN*52-90-26	Drilling & Structure Test Drilling Expenditures
IAN*52-90-27	Participation Programs — Expenditures
IAN*52-91**	Notice of Commencement of Exploratory Work

<b>Form No.</b>	<b>Title of Form</b>
IAN*52-91-1**	Notice of Commencement of Research and Development Work
IAN*52-92	Application for Authority to Drill Structure Test Hole
IAN*52-93	Report on Abandonment of Structure Test Hole
IAN*52-83	Grouping Notice
IAN*52-103*	Application for Oil and Gas Lease
IAN*51-183	Monthly Accident Summary

\*To be completed by Operator

\*\*To be completed in triplicate; all other forms to be completed in duplicate

All forms, except IAND 52-83, IAND 52-90-23 to IAND 52-90-27, IAND 52-91, IAND 52-91-1, and 52-103, are submitted to the appropriate District Oil and Gas Conservation Engineer.

Forms IAND 52-83, 52-90-23 to 52-90-27 and 52-103 are submitted to the Northern Non-Renewable Resources Branch, 400 Laurier Avenue West, Ottawa, Ontario K1A 0H4.

Forms IAND 52-91 and 52-91-1 should be submitted to the Oil and Gas Exploratory Operations Section — 112-11th Avenue S.E., Calgary, Alberta T2G 0X5.

The following forms have been issued pursuant to the Canada Oil and Gas Land Regulations and Canada Oil and Gas Drilling and Production Regulations. These forms are to be completed when applicable during the production stage of oil and gas wells, and refinery operations.

<b>Form No.</b>	<b>Title of Form</b>
IAN 52-116-1	Monthly Production Report
IAN 52-116-2	Monthly Disposition and Crown Royalty Statement
IAN 52-116-3	Monthly Gas Gathering Statement
DBS 6511-38*	Monthly Oil Pipeline Gathering Operations Statement
IAN 52-116-5	Monthly Crude Oil and Condensate Purchaser's Statement
IAN 52-116-6	Monthly Gas Plant Statement
DBS 6511-37*	Monthly Natural Gas Distributors Statement
IAN 52-116-8	Monthly Gas Processing Plant Products Statement

- IAAND 52-116-9    Monthly Liquified Petroleum Gas  
Purchaser's Statement
- IAAND 52-116-10   Monthly Refinery Operations  
Report
- IAAND 52-116-11   Monthly Gas Injection Operations  
Report
- IAAND 52-116-12   Statement of Nomination and  
Estimated Requirement of Crude  
Oil, Condensate and Pentanes Plus

**Notes:**

- (a) All forms to be completed by Operator.
- (b) Forms 6511-37 and 6511-38 are completed by the Operator in triplicate. He forwards the first two copies to the Northern Non-Renewable Resources Branch in Ottawa, and the third to the District Oil and Gas Conservation Engineer responsible for the District in which the well is located (see Fig. 20). The other forms listed above are completed in duplicate. The original is submitted to the Northern Non-Renewable Resources Branch in Ottawa and one copy to the appropriate District Oil and Gas Conservation Engineer.

All the above forms will be converted to SI units in 1977 and when published, will be distributed to industry in 1978. The use of SI units will become mandatory as of January 1, 1979.



# Appendix IV

## Summaries of the Geological Provinces

A selected bibliography to the geology of the Yukon and Northwest Territories is provided in Appendix V.

### 1. *Arctic Stable Platform*

The Arctic Stable Platform lies between the Precambrian Shield to the south and the Franklinian geosyncline to the north and west. The area is underlain by thin, gently dipping, relatively undisturbed Lower Paleozoic carbonates that overlie the craton and thicken northward from the Shield. The Platform is divided into several individual basins, Foxe Basin being the one farthest to the east.

### 2. *Franklinian Geosyncline (Arctic Fold Belt)*

The limits of Paleozoic deformation define the division between the Franklinian Geosyncline and the Arctic Platform to the south and east. The area was the site of continuous sedimentation from Cambrian to Upper Devonian time. Two depositional belts are recognized; a miogeosynclinal belt extending from Banks Island to northern Greenland, and a eugeosynclinal belt exposed only on Axel Heiberg and Ellesmere Islands. Thick carbonates and clastics constitute potential reservoirs. Strata were folded in the Ellesmerian orogeny of Late Devonian or Early Carboniferous time and these folded strata also constitute the "basement" underlying the Sverdrup Basin.

### 3. *Sverdrup Basin*

A major angular unconformity marks the base of the Sverdrup Basin, a successor basin with a stratigraphic sequence of Lower Pennsylvanian to Tertiary strata overlying the folded Paleozoic rocks of the Franklinian Geosyncline. The structural and depositional axis of the Sverdrup Basin strikes northeast from Banks Island to northern Ellesmere Island. The thickness of sediments in the basin is in excess of 7,600 metres along this axis. The sediments, which are interrupted by a number of unconformities, thin from the axis to form an elongate basin. Sediment thickness and facies indicate that the present south and east limits of the basin are close to the original depositional limits. Tertiary strata of the Arctic Coastal Plain onlap the northern and western margins. Evaporites of late Paleozoic age form piercement structures in the axial zone. Upper Cretaceous and older sediments are intruded by igneous sills and dykes of varying

thickness, mostly in the eastern half of the basin. The Eurekan Orogeny, in late Cretaceous and early Tertiary time, produced folding and faulting throughout the basin; deformation was accompanied by emplacement or reactivation of piercement bodies. Intensity of deformation increases towards the northeast margin of the basin. Thick, sandy sequences of Jurassic and Triassic age contain the major hydrocarbon reserves.

### 4. *Arctic Coastal Plain*

The north and west margins of the Sverdrup Basin, both on land and offshore, are covered by thick relatively undisturbed Tertiary and Pleistocene clastics. Beds dip gently toward, and thicken on, the continental shelf and slope. In this area the continental shelf is approximately 160 kilometres wide. The shelf offshore the Mackenzie Delta is termed the Beaufort Sea. The continental slope is defined as between 600 and 3,000 metres water depth. The deep Arctic Ocean, termed the Canada Basin, forms an abyssal plain seaward of the slope. The Tertiary and Mesozoic are considered to have the best offshore potential for oil and gas. Permanent ice cover and a short drilling season have hindered, or made costly, drilling in the offshore regions.

### 5. *Baffin Bay/Davis Strait Basin*

The Baffin Bay/Davis Strait Basin lies entirely offshore and has been explored to date only by regional geophysical surveys. Several theories to explain the origin of the basin have been advanced: a widely accepted one involves continental drift by which Greenland and the Baffin land mass spread apart about a pivot point located somewhere to the northwest. Geophysical surveys have demonstrated that the basin is underlain by an oceanic crust, that there is no mid-basin ridge, and that as much as 7,600 metres of sediment cover the floor. Sediments thin in nearshore areas and over the Davis Strait Sill. Rocks cropping out around the basin margins are predominantly Precambrian. Major centres of deposition are the Thule Basin off Greenland, the Lancaster Delta, the Home Bay Delta and the Cumberland Delta. Lancaster Sound and Jones Sound are structurally controlled grabens in which thick deltaic clastics accumulated. A major Tertiary drainage system transported sediment to the basin from a sediment source area to the west. The large volume of geologically young sediments and the presence of favourable trapping conditions

for hydrocarbons give the Baffin Bay/Davis Strait area a high hydrocarbon potential.

#### **6. Banks Basin**

The Banks Basin occupies the central and west-central part of Banks Island and the adjacent coastal plains. Tertiary and Cretaceous clastics overlie mainly Lower and Middle Devonian sediments over much of the area. Proterozoic rocks of the Minto Arch occur at the southernmost tip. The sediments of the Banks Basin have been sparsely drilled and the presence of thick Tertiary and Mesozoic sediments and the reefal facies of the Devonian-Silurian carbonates give the area a high potential for hydrocarbon accumulations.

#### **7. Mackenzie-Beaufort Basin**

The Mackenzie Delta/Beaufort Sea petroleum province is made up of a thick section containing productive Cretaceous and Tertiary sands. The Mackenzie Delta, the southern portion of the Mackenzie-Beaufort Basin, is bounded by the Romanzof uplift to the southwest, the Richardson Mountains to the south, the Eskimo Lakes Arch to the southeast and the Arctic Ocean to the north. The Beaufort Sea is one of several marginal embayments that occur as indentations in the coastline of the Arctic Ocean. The Coastal Plain, which lies adjacent to the Beaufort Sea, is laterally continuous with the continental shelf and is considered as the onshore, exposed extensions of the Beaufort Sea shelf. The Beaufort Sea petroleum province is contiguous with the Yukon and Mackenzie Coastal Plains, and the Banks Coastal Plain. Growth faults extend seaward from the Mackenzie Delta across the coastal plain. Shale diapirs form large, mostly offshore structures. Potential reservoir rocks, which include deltaic and marine sandstones are interbedded and continuous with organic-rich shales.

#### **8. Interior Plains**

a) *Great Slave Plain* — The Great Slave Plain encompasses an area extending westward from Great Slave Lake to the Liard Plateau and Mackenzie Mountains. Underlying strata are mainly of Devonian age, covered in part by remnants of a thick Cretaceous sequence. The total thickness of sediment ranges from zero in the east to more than 3,000 metres in the west. Gas reservoirs are found in porous dolomites and limestones of Middle Devonian age.

b) *Great Bear Plain* — The Great Bear Plain consists of Lower and Upper Cretaceous sediments partially on a bedrock of Ordovician to Devonian age. The total thickness of the sediments wedges from zero in the east to more than 1,800 metres in the west along the eastern edge of the Franklin Mountains.

c) *Anderson Plain* — The Anderson Plain lies east of the Mackenzie Delta. Cretaceous beds cover much of the Plain and lie unconformably on Lower and Middle Paleozoic beds. Sediments more than 2,400 metres thick occur in a southwest-northeast trend through the wells C.P.O.G. Kugaluk N-02 and Elf Horton River G-02. Hydrocarbon shows have been encountered in the Cretaceous deposits.

d) *Mackenzie Plain* — The Mackenzie Plain lies between the Franklin and Mackenzie Mountains. Cretaceous beds lie unconformably on Lower and Middle Paleozoic beds. Sediments range in thickness from 1,200 metres to 2,700 metres. Oil is produced in the Mackenzie Plain at Norman Wells, from the Devonian Kee Scarp formation. Additional hydrocarbon shows have been encountered in the Cretaceous and Silurian.

e) *Peel Plain* — The Peel Plain lies northeast of the Peel Plateau and northwest of the Mackenzie Plain. It is covered by Cretaceous and Jurassic sediments which overlie Paleozoic carbonates and shales. The sediments are similar to those of the Mackenzie Plain and range in thickness from more than 4,200 metres in the southwest to 2,400 metres in the northeast. Hydrocarbon shows have been encountered in the Lower Devonian.

#### **9. Liard Plateau and Range**

The Liard Plateau and Range lie west of the southern portion of the Great Slave Plain and northwest of the Fort Nelson Lowland. A thin Cretaceous cover lies unconformably on Paleozoic beds. The Beaver River and Pointed Mountain fields produce or have produced gas from thrust-dolomites of the Nahanni Formation of Middle Devonian Age. Current production in the Beaver River field in the Yukon is from large faulted anticlines containing Mississippian sands.

#### 10. ***Eagle Plain***

The Eagle Plain basin is contained between the Ogilvie and Richardson Mountains. Sediments approach 6,100 metres in thickness, of which about 3,000 metres are late Paleozoic to Mesozoic in age, the remainder being Cenozoic. The basin has been tectonically deformed. Hydrocarbon shows have been encountered in Mississippian, Devonian and Ordovician beds.

#### 11. ***Peel Plateau***

The Peel Plateau is bounded on the northwest and the east by the Peel Plateau Plain, on the south by the Mackenzie Mountains, and on the west by the Richardson Mountains. The Plateau is covered by Tertiary and Cretaceous clastics unconformably overlying Paleozoic shales and carbonates. The sediments range in thickness from 3,000 metres in the east to 6,100 metres in the west. Shows of hydrocarbons have been encountered in Cretaceous and Middle Devonian strata.

#### 12. ***Old Crow Basin***

The Old Crow Basin is a relatively unexplored intermontaine basin covering an area of about 6,200 square kilometres centered at about latitude 68°N and longitude 140°W. Geophysical data indicate a thickness of from 600 to 1,500 metres of Mesozoic and Tertiary clastics overlying as much as 3,000 metres of Upper Devonian to Permo-Carboniferous sediments. The Old Crow Basin as it now exists was formed by the Laramide orogeny in Tertiary time.

#### 13. ***Whitehorse Basin***

The Whitehorse Basin lies at the northern end of the Central Cordilleran Geosyncline. It is about 240 kilometres long and 110 kilometres wide and contains up to 4,600 metres of sediments ranging in age from early Cretaceous to Late Triassic.



# Appendix V

## Selected Bibliography

A wide variety of reports and papers applicable to geological provinces or basins in northern Canada are available, a majority are Geological Survey of Canada (GSC) publications or in proceedings and memoirs of various Societies. A listing of all GSC reports may be found in "Index to Publications 1959 - 1974" by P.J. Griffen, published by the GSC in 1976. The following is a list of the more important of these papers

1. Aitken J.D., and Glass D.J. (Editors)  
1973: GAC-CSPG proceedings of the Symposium on the Geology of the Canadian Arctic.
2. Yorath C.J., Parker E.R. and Glass D.J. (Editors)  
1975: Canada's Continental Margins and Offshore Petroleum Exploration; C.S.P.G. Memoir 4, Canadian Society of Petroleum Geologists.
3. McCrossan R.G. (Editor)  
1973: Future Petroleum Provinces of Canada; C.S.P.G. Memoir 1, Canadian Society of Petroleum Geologists.
4. Wren A.E. and Cruz R.B. (Editors)  
1974: Proceedings of the 1973 National Convention; Canadian Society of Exploration Geophysicists.

For a complete list of oil industry technical reports released from confidential status, the reader should refer to the Departmental publication "Technical Reports Available for Inspection — 1976".

Important references not found in the preceding publications are listed below.

### **Northwest Territories — Mainland**

1. Bily C. and Dick J.W.C.  
1974: Naturally occurring gas hydrates in the Mackenzie Delta NWT; Bulletin of Can. Pet. Geol. Vol. 22, No. 3 pp 340-353.
2. Cote R.P., Rector R., and Lerand M.  
1974: Gulf describes Geology of the Parsons Lake Gas find, Can. Pet. — April pp 72-78.

3. Crickmay, C.H.  
1970: Ramparts, Beavertail and other Devonian Formations; Bull. Can. Pet. Geol. Vol. 19, No. 1 pp 67-79.
4. Law J.  
1971: Regional Devonian Geology and Oil and Gas Possibilities, Upper Mackenzie River Area; Bull. Can. Pet. Geol. Vol. 19 No. 2 pp 437-484.
5. Meijer-Drees N.C.  
1975: Geology of the Lower Paleozoic Formations in the Subsurface of the Fort Simpson Area, District of Mackenzie, G.S.C. paper 74-40.
6. Smith M.W.  
1976: Permafrost in the Mackenzie Delta; G.S.C. paper 75-28.
7. Vopni L.K., and Lerbekmo J.F.  
1972: The Horn Plateau Formation: A Middle Devonian Coral Reef Northwest Territories; Bull Can. Pet Geol. Vol 20, No 3 pp 498-548.
8. Young F.G.  
1975: Upper Cretaceous Stratigraphy, Yukon Coastal Plain and Northwestern Mackenzie Delta; G.S.C. Bull 249.

### **Eagle Plain and Northern Yukon**

1. Bamber E.W. and Waterhouse J.B.  
1971: Carboniferous and Permian Stratigraphy and Paleontology, Northern Yukon Territory; Bull Can Pet Geol Vol 19 No 1 pp 29-249.
2. Lenz A.C.  
1972: Ordovician to Devonian History of Northern Yukon and adjacent District of Mackenzie; Bull Can Pet Geol Vol 20 No 2 pp 321-361.
3. Miall A.D.  
1973: Regional Geology of Northern Yukon; Bull Can Pet Geol Vol 21 No 1 pp 81-116.
4. Norris A.W.  
1967: Devonian of Northern Yukon Territory and adjacent District of Mackenzie, Inter. Sym. on Dev. System, A.S.P.G.

### **Arctic Islands**

1. Frebold H.  
1975: Jurassic Faunas of the Canadian Arctic;  
G.S.C. Bull 243.
2. Klován J.E. and Embry A.F. III  
1971: Upper Devonian Stratigraphy, Northeastern  
Banks Island; Bull Can Pet Geol Vol 19 No 4  
pp 705-729.
3. Plauchut B.P.  
1971: Geology of the Sverdrup Basin; Bull Can Pet  
Geol Vol 19 No 3 pp 659-679.
4. Plauchut B.P. and Jutard G.G.  
1976: Cretaceous and Tertiary Stratigraphy, Banks  
and Eglinton Islands and Anderson Plains;  
Bull Can Pet Geol Vol 24 No 3 pp 321-371.
5. Snowdon L.R. and Roy K.J.  
1975: Regional Organic Metamorphism in the  
Mesozoic Strata of the Sverdrup Basin; Bull  
Can Pet Geol Vol 23, No 1 pp 131-172.
6. Stuart-Smith J.H. and Wennekers J.H.N.  
1977: Geology and Hydrocarbon Discoveries of  
Canadian Arctic Islands; AAPG Bull Vol 61  
No 1 pp 1-28.

### **Arctic Coastal Plain and Continental Shelf**

1. Sobczak L.E.  
1975: Gravity and Deep Structure of the  
Continental Margin of Banks Island and  
Mackenzie Delta; Can Jour Earth Sc. Vol 12,  
pp 378-395.

### **Hudson Bay Basin and Lowlands**

1. Sanford B.V. and Norris A.W.  
1975: Devonian Stratigraphy of the Hudson  
Platform: Part I, Stratigraphy and Economic  
Geology. G.S.C. Memoir 379.

### **Foxe Basin and Baffin Bay**

1. Keen C.E., et al  
1972: Geophysical Studies in Baffin Bay and some  
Tectonic Implications; Can J. Earth Sc. Vol 9  
No 3.
2. Keen C.E. and Barrett D.L.  
1973: Structural Characteristics of Some  
Sedimentary Basins in Northern Baffin Bay;  
Can J. Earth Sc. Vol 10 No 7 pp 1267-1278.
3. Trettin H.P.  
1975: Investigations of Lower Paleozoic Geology,  
Foxe Basin, Northeastern Melville Peninsula  
and parts of Northwestern and Central Baffin  
Island; G.S.C. Bulletin 251.







Oil and Gas  
Activities 1977

CAI  
IA61  
- 032







# Oil and Gas Activities 1977

(Edition No. 14)

## **Report on the Activities in 1977 of the Oil and Gas Industry in the Yukon Territory and Northwest Territories**

Compiled by Oil and Gas Exploratory Operations  
Section.

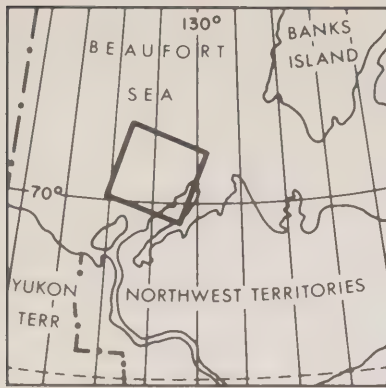
Northern Non-Renewable Resources Branch and  
published under authority of the Hon. J. Hugh  
Faulkner, Minister of Indian and Northern Affairs,  
Ottawa, 1978.

QS-8191-000-EE-A1




© Minister of Supply and Services Canada 1978  
Catalogue No. R71-6 / 1977  
ISBN O-662-10161-8

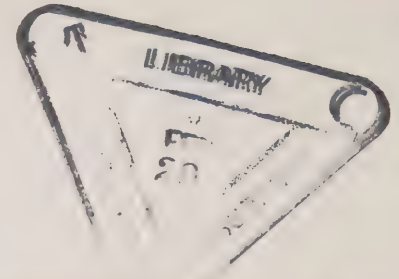
Cette publication peut aussi être obtenue en français

*The official name of this department, according to the Government Organization Act, is the Department of Indian Affairs and Northern Development (DIAND). In recent years there has been a tendency to abbreviate these longer names for general convenience, and DIAND is often referred to as Indian Affairs and Northern Development (I.A.N.D.) or as Indian and Northern Affairs (INA) — although frequently the term Department is retained, giving the initials DINA. Any of these four groups of initials is acceptable and often, as in this report, may be used interchangeably.*



### Legend

-  Gas Discovery
-  Suspended Well
-  1978 Location



Satellite photograph of the Beaufort Sea-Tuktoyaktuk Peninsula (False-colour infra-red image)

# Table of Contents

<b>6 Preface</b>	<b>53 Pipelines</b>
<b>7 Summary</b>	53 The Foothills Project
<b>9 Introduction</b>	56 Route and Mileages of the Northern Pipeline
<b>11 Oil and Gas Discoveries and Reserves</b>	56 The Polar Gas Project
13 Geological Provinces North of 60 and the Oil and Gas discoveries there to end of 1977	<b>57 Participation and Research Projects</b>
19 Report of the Reserves Committee of the Canadian Petroleum Association	57 Geophysical Surveys
20 Summary of Oil and Natural Gas Resources of Canada	57 Research Programs
<b>21 Land Administration</b>	<i>Arctic Petroleum Operators Association (APOA)</i>
<b>26 Act and Regulations</b>	EAMES
26 Bill C-20, Canada Oil and Gas Act	<b>60 Appendix I</b>
26 Canada Oil and Gas Land Regulations	Sources for information relative to oil and gas activity North of 60
28 Canada Oil and Gas Geophysical Regulations	<b>74 Appendix II</b>
28 Canada Oil and Gas Drilling Regulations	Directives
28 Canada Oil and Gas Production Regulations	<b>76 Appendix III</b>
28 Land Use Regulations	Reporting forms
29 Metrication in the Oil and Gas Industry	<b>78 Appendix IV</b>
<b>30 Revenues</b>	Summaries of the Geological Provinces
<b>36 Exploration, Discoveries and Drilling Operations</b>	<b>81 Appendix V</b>
36 Exploration	Selected Geological References
36 <i>Geological and Photogeological Surveys</i>	
36 <i>Seismic Land Surveys</i>	
36 <i>Seismic Marine Surveys</i>	
37 Discoveries	
37 Drilling	
<b>50 Net Cash Expenditures by Industry in 1977</b>	
<b>52 Production, Processing and Refining</b>	





# Tables and Illustrations

## Tables

11	Table 1.	Area and volume of sediments.
19	Table 2.	Canadian Petroleum Association reserves.
20	Table 3.	Summary of Oil and Natural Gas Resources of Canada — 1975.
21	Table 4.	Number of issued permits and leases with acreage as of December 31, 1977.
34	Table 5.	Gross revenue, oil and gas (calendar year).
35	Table 6.	Gross revenue, oil and gas (fiscal year).
40	Table 7.	1973-77 exploration survey statistics.
46	Table 8.	Wells abandoned or completed in 1977.
50	Table 9.	Net Cash Expenditures by Industry in 1976 (Final).
50	Table 10.	Net Cash Expenditures by Industry in 1977 (Preliminary).

## Illustrations

42	Oil and gas fields and discoveries (map) centrefold.
12	Figure 1. Geological Provinces (map).
22	Figure 2. Area held under oil and gas permit
23	Figure 3. Acreage under lease — by year.
24	Figure 4. Permit terms and work requirement zones.
25	Figure 5. Permit terms and deposit requirements — per acre.
27	Figure 6. Flow diagram of disposal of oil and gas rights.
31	Figure 7. Gross revenue, oil and gas (calendar year).
32	Figure 8. Gross revenue, oil and gas (fiscal year).
33	Figure 9. Value of work bonus tenders — oil and gas.
38	Figure 10. Exploration activity - geological crew months - land seismic crew months

39	Figure 11. Exploration activity - seismic line miles
41	Figure 12. Wells completed or abandoned in 1977 — southern N.W.T. and Y.T. (map).
44	Figure 13. Wells completed or abandoned in 1977 — Mackenzie Delta/Beaufort Sea (map).
45	Figure 14. Wells completed or abandoned in 1977 — Arctic Islands (map).
47	Figure 15. Wells drilled.
48	Figure 16. Depth drilled.
49	Figure 17. Oil and gas exploration expenditures submitted for work credits.
55	Figure 18. Northern pipelines (map).
59	Figure 19. Eastern Arctic Marine Environmental Survey (EAMES) Area.
63	Figure 20. District boundaries.

## Photographs

<i>Frontispiece</i>	Satellite photograph of the Beaufort Sea.
11	Photo 1. Testing Bent Horn F-72A well.
29	Photo 2. Imperial Oil Refinery at Norman Wells.
36	Photo 3. DOT icebreaker offshore at Resolute Bay.
53	Photo 4. Musk-ox on Arctic Tundra.
54	Photo 5. Telesat receiving station at Norman Wells.
57	Photo 6. Modern jet at Resolute airport.

# Preface

This report covers oil and gas activities North of 60 for the year 1977. All aspects of these operations in the Yukon and Northwest Territories are administered by the Northern Non-Renewable Resources Branch, Department of Indian and Northern Affairs. It is the intent of the Department to provide for the orderly exploration and exploitation of oil and gas, thereby achieving local benefits to the specific areas involved as well as benefitting the people of Canada in general through the revenues accruing to the Crown.

As of March 1, 1978 the Minister and departmental officers responsible for the administration of oil and gas resources in the Northwest Territories, Yukon Territory and the northern offshore areas were:

Minister — The Honourable J. Hugh Faulkner  
Deputy Minister — Arthur Kroeger  
Assistant Deputy Minister (Northern Affairs) —  
E.M.R. Cotterill  
Director, Northern Non-Renewable Resources  
Branch — Dr. H.W. Woodward

## Oil and Gas Lands Division

Chief — P. Sullivan  
Head, Oil and Gas Rights Section — J.A.S. Barrett  
Head, Production and Royalty Section —  
R.J. Marshall

## Oil and Gas Resource Evaluation Division

Chief — Dr. James P. Hea  
Head, Oil and Gas Exploratory Operations  
Section — S.A. Kanik

## Oil and Gas Engineering Division

Chief — Appointment pending  
Head, Drilling and Completion Engineering  
Section — M.K. El-Defrawy  
Head, Reservoir Engineering Section —  
T.M. Baker  
Head, Pipelines Engineering Section —  
R.E. Jackson  
Scientific Research and Special Projects  
Co-ordinator — I.M. Feldman  
Regional Oil and Gas Conservation Engineer,  
N.W.T. (Yellowknife) — M.D. Thomas  
Regional Oil and Gas Conservation Engineer,  
Y.T. (Whitehorse) — G.E. Blue  
District Oil and Gas Conservation Engineer  
• for Arctic Islands, District 1, N.W.T.,  
(in Yellowknife) — B.N. Berry  
• for Southern Sector, N.W.T., District 2, N.W.T.,  
(in Yellowknife) — appointment pending  
• for Northern Sector, N.W.T., District 3, (in Inuvik)  
— D.R. Whitehead



# Summary

Oil and gas exploration was carried on through 1977 in the vast area of the Canadian Arctic North of 60. One significant oil discovery and some gas discoveries were made in the Beaufort Sea, gas discoveries occurred at a number of sites in the Mackenzie Delta, and there was one new gas find in the Yukon Territory. On the whole, the decline in exploration activity that has been becoming evident over the past four or five years, continued.

According to the Report of the Reserves Committee of the Canadian Petroleum Association, the estimated *proved* and *probable* reserves of crude oil — both for Canada North of 60 and for the whole of Canada — were lower than the 1976 estimates. On the other hand, reserves of natural gas are estimated to have increased, especially reserves of marketable natural gas. However, as of present estimates, by far the greater of these gas reserves are located in the western provinces.

Drilling activity also decreased in 1977, but is expected to continue actively in 1978 in the offshore areas of the Beaufort Sea and offshore from the Drake field on Melville Island.

Although revenues for the *calendar* year 1977 showed a slight increase over 1976, the returns for the *fiscal* year 1977-78 showed a decline of \$0.9 million. Expenditures by Industry, however, increased by approximately \$50 million due to the fact that northern exploration, drilling and development are now having to be carried out in more distant, hostile, and therefore, more expensive areas.

Production of Gas in 1977 from both the Pointed Mountain Field in the Northwest Territories and the Beaver River Field on the Yukon-British Columbia border was down from the 1976 total. The same was true for oil production at the Norman Wells Field. Gas from the Pointed Mountain Field continues to be processed at the Clarke Lake Plant at Fort Nelson, B.C.; oil from the Norman Wells Field is refined locally at the Imperial Oil refinery.

No new disposals of oil and gas rights were made during the year, the number of permits and leases dropping by about 20 per cent compared to 1976, with a consequent reduction of acreage held. Applications for leases continued to be received, however, and, as a result of amendments to the Regulations, most applications on hand are expected to be dealt with in 1978.

The proposed new *Canada Oil and Gas Act* (Bill C-20) was tabled in the House of Commons in December, 1977 and is expected to be passed into law sometime in 1978. Pending its enactment, amendments to the existing Regulations were promulgated in July and made effective in August, 1977. Significant aspects of the new Act will include: increased work obligations, shorter confidential periods for reports on exploration projects, increased Ministerial discretion and direction, as well as an increased role for Petro-Canada.

Metriation of the Oil and Gas Industry continues, the objective being a complete change to SI units by January 1, 1979.

In 1977, all proposals for building a Mackenzie Valley Gas Pipeline were dropped. Instead, approval was given in both the United States and Canada for the construction of a gas pipeline from Prudhoe Bay that would roughly parallel the Alyeska line and the Alaska Highway as far as the vicinity of Caroline in Alberta. From here branch lines east and west, would connect with existing or proposed transmission lines to bring the gas to various centres in the Lower 48 States. Provision is made for a spur line (the Dempster lateral) to bring gas from the Mackenzie Delta as early as the 1980s or when considered desirable. The whole Canadian section of this line — from the Alaska-Yukon Border to the Caroline area — is to be sponsored by Foothills (Yukon) Ltd. Originally this was known as the *Alcan Proposal* but the name is now changed to the *Foothills Project*. The main Canadian section, from the Alaska border to the Alberta terminus is estimated at 2,765 miles. The Dempster lateral would add another 737 miles. Exclusive of the Dempster lateral, the costs for building the Canadian section are estimated at \$4.7 billion in 1977 dollars. Work is expected to generate a total of about 68,000 man-years employment.

In 1977, the Polar Gas Group filed an application with the National Energy Board and DINA for approval to build a gas pipeline from the Drake Point and Hecla fields on Melville Island, N.W.T., to a junction with the Trans Canada Pipeline system near Longlac, Ontario. This would involve construction of some 2,340 miles of pipeline and would include 89 miles of marine crossings. The route would run east and then south across the islands of the Archipelago to reach the mainland on the south shore of Bellot Strait, on the tip of Bothia Peninsula. From here it would run south and then east to its terminus near Longlac. Depending on the daily amount of gas to be delivered, the number of compressor stations required along the route would vary between ten and thirty. Estimated cost of this project is about \$6.1 billion — in 1976 dollars. A decision on this proposal is expected in 1978.

During the year projects included seismic surveys North of 60: Eureka Exploration Ltd. completed its 2,000-mile marine project in the Baffin Bay-Davis Strait area and partially completed a 1,800-mile project in the Beaufort Sea; Sun Oil Company completed the third and final year of its seismic surveys in the Sverdrup Basin at a total cost of about \$40 million.

The Arctic Petroleum Operators Association (APOA) continued their already-initiated research projects in the Arctic and made a start on ten new ones. Several environmental research projects already begun in the Baffin Bay area by various oil companies were continued. In addition, the federal government and industry jointly undertook a comprehensive program of marine environmental studies in the eastern Arctic known as the Eastern Arctic Marine Environmental Studies (EAMES) Program. The estimated cost is about \$12 million of which the major portion will be borne by industry.

# Introduction

So far as both the public and the Oil and Gas Industry were concerned, 1977 was a very significant year. From the *public* point of view, it became evident that a number of ideas about the *frontier* area North of 60 needed to be re-examined. These included the long-standing belief of Arctic Canada as a rich storehouse of inexhaustible resources which needed only to be tapped in order to become immediately available to the user communities of the south. So far as oil and gas development was concerned, the social and economic studies and the technical research and exploration that had been carried on over the previous years combined at this point to demonstrate that:

- while oil and gas exist in the areas North of 60, the fields discovered to date — after many years of intensive search and many millions of exploration dollars — are not large enough to produce sufficient supplies to make their development economically justifiable at *present*. Nothing approaching the Prudhoe Bay field has yet been found in the Canadian North, and by world standards such as the Middle East, even Prudhoe Bay is not considered outstandingly large.
- transportation facilities, in this case pipelines, are not only extremely expensive to build but, in the northern environment, present enormous difficulties of construction and maintenance not encountered in the more southern parts of the country. To justify such expense and effort, a large supply of gas or oil must be available at the northern terminus of the pipeline.

- the North is not an empty, barren wilderness that nothing can destroy, but rather, a fragile milieu that requires care and consideration if its resources are to be exploited without causing environmental damage.

- Social and environmental assessments must be made before exploitation is permitted or, in some cases, before exploration is allowed to continue further. Such studies require time and this results in delays that can be very costly when large expenditure of time, effort, money and equipment are involved.

The *industry*, on the other hand, was gradually becoming aware of these aspects and, for the last five years or so, its activity in the North has been declining, with fewer wells being drilled each year and to a lesser total footage (see Figs. 15 and 16 of this report). Exploration is having to be carried increasingly farther into the more hostile areas, with the consequent escalation of transportation and maintenance costs. Much work, therefore, is now being carried out in areas where, as a rule, the short season only permits one or two wells to be drilled per year. A result has been that fewer companies than previously are now involved in northern oil and gas exploration, the smaller ones gradually dropping out leaving the field to the larger companies who possess greater wealth and resources and are thus better able to work in the more distant, high-cost areas. Some of the slowing down of activity in recent years may also have been due to uncertainty regarding the scope of the proposed new regulations governing the industry. This uncertainty has now been considerably dispelled as a result of the guidelines issued by the Minister in 1977.



The political situation, too, has had a strong impact on northern petroleum development, particularly as it concerns oil — for, at present, gas surpluses in Alberta seem more than adequate to the needs of the moment. The rise in the world price of oil has made previously *uneconomic* oil reserves worthy of consideration for possible development, particularly as some of these reserves, such as the Alberta tar sands and the heavy crude deposits of the Lloydminster area, do not involve the transportation difficulties that must be faced in the north.

All these aspects of oil and gas operations were highlighted in 1977 by the government decision not to allow the building of a Mackenzie Valley gas pipeline but, instead, to allow the construction of a line along the Alaska Highway route through a joint Canada-United States agreement. This line would cross Canadian territory to link up with existing distribution pipelines to centres in the Lower 48 States. Included in this arrangement was provision for the construction of a spur pipeline to tap Mackenzie Delta gas reserves, perhaps in the 1980's. With the present apparent surplus of gas supplies in the western provinces, the imminent need for such a spur seems doubtful.

The present decline in both enthusiasm and activity so far as oil and gas operations in the north are concerned, could alter suddenly and completely if a major oil field were to be discovered. Such a find seems unlikely to occur in the better known and long-explored areas of the Arctic, and present hopes are centred on the promising, but more remote areas of the Beaufort Sea and the Baffin Bay-Davis Strait. Work is continuing in Beaufort Sea despite the incredibly high costs of drilling and island-building. Drilling in the deep, offshore areas of Baffin Bay and Davis Strait is delayed pending the completion of the required environmental and technical research to be carried out under the Eastern Arctic Marine Environmental Studies (EAMES) program. Costs of this project, estimated as well over \$12 million, are to be divided between the federal government and the oil and gas industry. As it is anticipated that these studies will take three to four years to complete, the EAMES reports are not expected in their entirety until sometime in the early 1980s.

# Oil and Gas Discoveries and Reserves

The area of Canada North of 60 covers roughly 3 800 000 square kilometres of which nearly one-third, about 3 072 000 square kilometres, are underlain by sedimentary rocks. A comparison of the area and volume of sediments in the Western Provinces, the Yukon and the Northwest Territories (including the Arctic Islands) is given in Table 1.

For convenient reference, the area has been divided into thirteen major geological *provinces* and a number of *sub-provinces* as shown in Figure 1. A short list of relevant references to the geology of the area is given in Appendix V. More details of these geological *provinces* are given in Appendix IV, *Summaries of the Geological Provinces*. The recoveries map (at centre fold) shows the location of all oil and gas fields, including the 1977 discoveries.

The distribution of oil and gas discoveries and recoveries, and the potential for future discoveries in the various geological *provinces* is outlined in the following section. An asterisk to the left of the well name indicates discovery or recovery of hydrocarbons in 1977.



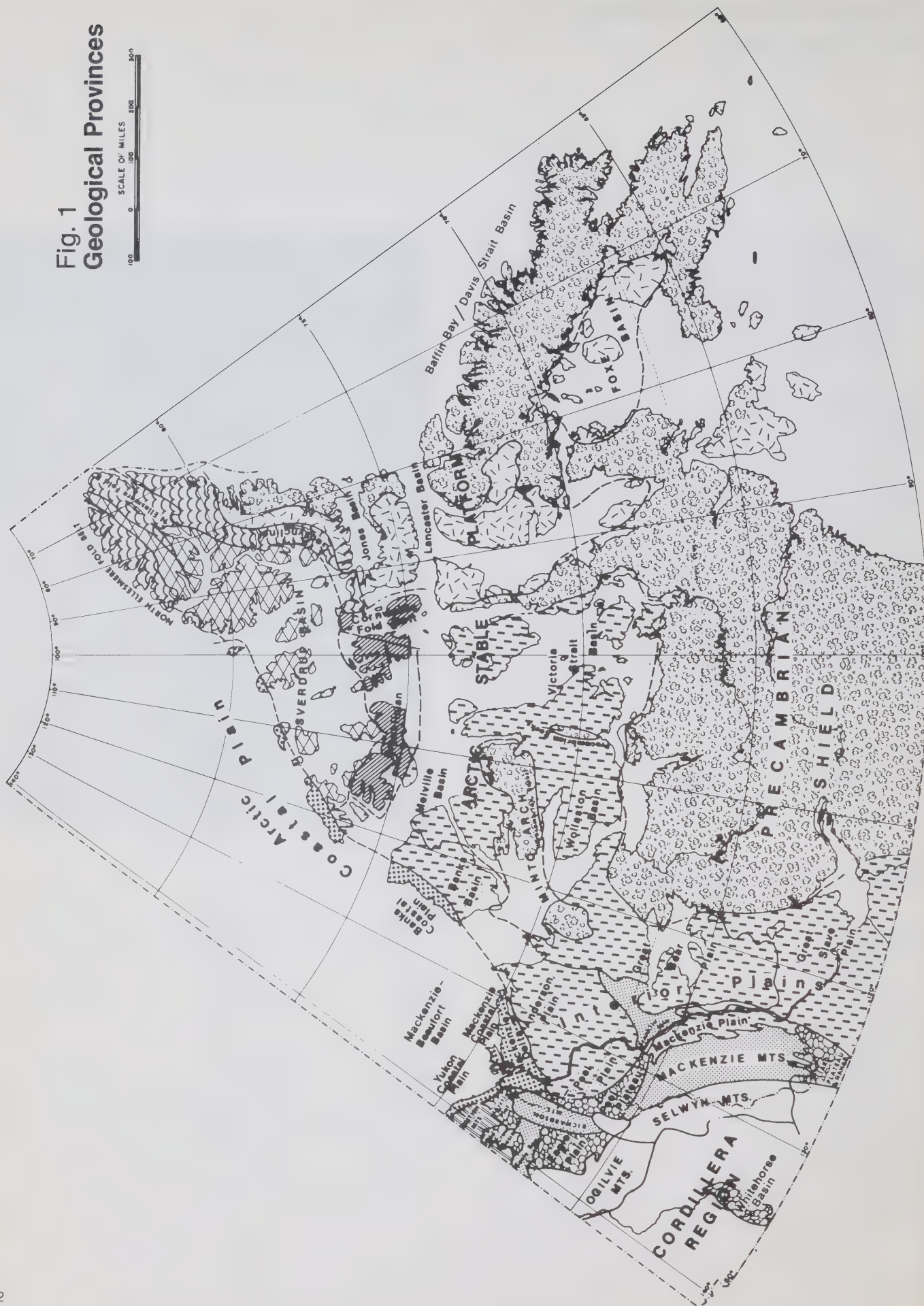
Testing Bent Horn F-72A Well. (Courtesy Panartic Oils Ltd.)

**Table 1 — Area and Volume of Sediments**

Region	Total area (sq. miles)	Volume of sediments (cu. miles)	Total area (sq. kilometres)	Volume of sediments (cu. kilometres)
Manitoba & Saskatchewan	220 000	165 000	570 000	688 000
Alberta	224 700	333 400	582 000	1 390 000
British Columbia	138 500	298 000	359 000	1 242 000
Yukon & Northwest Territories				
Mainland	541 500	421 000	1 402 000	1 755 000
Arctic Archipelago	644 600	1 275 000	1 670 000	5 314 000
	1 769 300	2 492 400	4 583 000	10 389 000



Fig. 1  
Geological Provinces





## Geological Provinces North of 60 and the Oil and Gas discoveries there to end of 1977

(\* indicates discovery/recovery in 1977).

1. Arctic Stable Platform — only four wells have been drilled to date, all unsuccessful.
2. Franklinian Geosyncline — significant quantities of light gravity crude oil has been recovered from Middle Devonian carbonates on Cameron Island.

Well Name	Location	Well Status	Reserve Status	Horizon	Lithology	Spud Date	Completion Date	Potential
<b>Cameron Island</b>								
Panarctic et al Bent Horn N-72	N-72-76-30-103-30	Potential Oil & Gas Well	Oil Show	Blue Fiord	Carbonate	24-11-73	06-04-74	500 BOPD on test
Panarctic et al Bent Horn F-72A	F-72-76-30-103-30	Potential Oil & Gas Well	Oil Show	Blue Fiord	Carbonate	21-05-75	19-12-75	445 Bbls oil DST
Panarctic et al Bent Horn A-02	A-02-76-30-104-00	Potential Oil & Gas Well	Oil Discovery	—	—	06-05-76	01-08-76	—

3. Sverdrup Basin — seven gas fields have been discovered to date. Recoveries of *crude oil* have been recorded from Ellesmere and Thor Islands.

### Gas Discoveries

<b>Melville Island</b>								
Panarctic Drake Point N-67	N-67-76-30-108-30	Abandoned	Gas Discovery	Jurassic	Sandstone	14-04-69	02-09-69	Abandoned after blowout
Panarctic Drake Point L-67	L-67-76-30-108-30	Potential Dual Gas	Gas Dev.	Jurassic Bjorne	Sandstone	28-09-69	26-02-70	DST 10 MMCF (Jurassic)
Panarctic et al Drake F-16	F-16-76-30-108-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	10-05-72	16-06-72	AOF 265 MMCFD
Panarctic et al Drake B-44	B-44-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	23-09-72	22-10-72	DST 5.5 MMVFD
Panarctic et al Drake D-68	D-68-76-30-108-30	Potential Gas	Gas Dev.	Jurassic Bjorne	Sandstone	07-06-73	25-03-74	DST 8.7 MMCFD DST 40.1 MCFD
Panarctic et al Drake E-78	E-78-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	02-05-74	27-05-74	DST 4.8 MMCFD
Panarctic et al Drake D-73	D-73-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	23-04-75	10-05-75	DST 8.1 MMCFD
Panarctic et al East Drake I-55	I-55-76-30-107-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	06-03-75	16-04-75	AOF 58 MMCFD critical flow proved
Panarctic et al W. Hecla N-52	N-52-76-30-110-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	05-03-74	15-04-74	AOF 52 MMCFD
Panarctic et al E. Hecla F-62	F-62-76-30-110-00	Potential Gas	Gas Discovery	Jurassic	Sandstone	11-11-72	12-12-72	AOF 96 MMCFD
Panarctic et al Hecla I-69	I-69-76-20-110-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	22-02-73	11-04-73	DST 7.8 MMCFD
Panarctic et al E. Helca C-32	C-32-76-30-110-00	Potential Gas	Gas Discovery	Jurassic	Sandstone	07-11-75	10-12-75	DST 8.5 MMCFD

Panarctic et al W. Helca P-62	P-62-76 30-110-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	07-01-76	22-02-76	DST 5.3 MMCFD
Panarctic W. Helca M-25	M-25-76 30-111-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	14-03-76	18-04-76	DST 5.4 MMCFD
<b>Thor Island</b>								
Panarctic et al Thor H-28	H-28-78 10-103-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	28-02-73	10-05-73	Flow test to 55 MMCFD
<b>Ellef Ringnes Island</b>								
Panarctic et al Kristoffer Bay B-06	B-06-78 12-102-30	Potential Gas	Gas Discovery	Heiberg	Sandstone	09-11-71	17-03-72	DST 10 MMCFD
Panarctic et al Jackson Bay G-16A	G-16-78 10-101-00	Potential Gas	Gas Discovery	Heiberg	Sandstone	16-03-76	30-04-76	DST 7.34 MMCFD
<b>King Christian Island</b>								
Panarctic King Christian D-18	D-18-77- 50-101-00	Abandoned	Gas Discovery	Heiberg	Sandstone	14-10-70	25-01-71	Abandoned after blowout
Panarctic King Christian D-18A	D-18-77- 50-101-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	26-11-70	15-03-71	AOF 264 MMCFD
Panarctic et al King Christian N-06	N-06-77- 50-101-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	13-05-71	20-09-71	AOF 340 MMCFD
Dome Arctic Ventures Wallis K-62	K-62-78- 00-102-00	Potential Gas	Gas Discovery	Heiberg	Sandstone	27-11-72	21-02-73	DST 12.43 MMCFD
<b>Crude Oil Recoveries</b>								
<b>Ellesmere Island</b>								
Panarctic Romulus C-42	C-42- 80-00 84-00	Suspended	Oil & Gas Show	Jurassic Schei Point Bjorne	Sandstone	29-01-72	25-07-72	Area has potential
<b>Thor Island</b>								
Panarctic et al Thor P-38	P-38-78- 10-103-00	Suspended	Oil Show	Heiberg	Sandstone	06-04-72	10-05-72	Thin Oil leg on water

4. Arctic Coastal Plain — no successful wells to date.

5. Banks Basin — no hydrocarbon discoveries to date, but the area is considered to have a moderate potential for hydrocarbon accumulation.

6. Baffin Bay/Davis Strait — this *province* lies entirely offshore and to date has been explored by regional geophysical surveys. It contains several areas that hold promise for future hydrocarbon discoveries: the Thule Basin off Greenland, Lancaster Delta, Home Bay Delta, Cumberland Delta, Lancaster Sound and Jones Sound.

7. Mackenzie/Beaufort Basin — oil and gas have been found in Paleozoic carbonates and in Lower Cretaceous and Tertiary sands. All these finds are in the Mackenzie Delta Section, Adgo and Netserk being offshore.

#### Crude Oil Discoveries

##### **Mackenzie Delta — Tuktoyaktuk Peninsula**

IOE Atkinson H-25	H-25-69- 50-131-45	Abandoned	Potential Oil Well	Lower Cretaceous	Sandstone	14-12-69	26-02-70	3150 BOPD calc. 24.3° API
IOE Mayogiak J-17	J-17-69- 30-132-45	Abandoned	Potential Oil Well	Devonian & Lower Cretaceous	Carbonate & Sandstone	03-04-71	06-08-71	7320 BOPD 33.6° API
Imp. Ivik J-26	J-26-69- 40-134-15	Suspended	Potential Oil & Gas Well	Tertiary	Sandstone	08-04-72	30-09-72	5345 BOPD calc. 24° API
Imp. Ivik K-54	K-54-69- 40-134-15	Abandoned	Potential Oil	Tertiary	Sandstone	30-03-73	08-06-73	829 BOPD calc. 24° API
Imp. Adgo F-28	F-28-69 30-135-45	Plugged & Abandoned	Gas & Oil	Tertiary	Sandstone	28-12-73	19-03-74	1500 BOPD 17.5° API
Shell Kugpik O-13	O-13-69 00-135-15	Suspended	Oil	Lower Cretaceous	Sandstone	26-03-73	30-09-73	2900 BOPD 50° API

Shell Kumak J-06	J-06-69-20-135-00	Suspended	Oil	Tertiary	Sandstone	24-11-73	01-05-74	5000 BOPD 27.1° & 31.3° API
Shell Niglintgak M-19	M-19-69-20-135-15	Suspended	Oil & Gas	Tertiary	Sandstone	01-06-74	25-01-75	O.T.S. 18.8-32° API
Sun et al Garry P-04	P-04-69-30-135-30	Suspended	Oil & Gas	—	—	25-08-75	05-01-76	O.T.S. DST
Gulf Mobil Kamik D-48	D-48-69-00-133-15	Suspended	Oil & Gas	Lower Cretaceous	Sandstone	23-12-75	04-04-76	O.T.S. DST
<b>Beaufort Sea</b> Dome Hunt Nektoralik K-59	K-59-70-30-136-00	Abandoned	Oil & Gas	—	—	08-08-77	17-10-77	—
<b>Gas Discoveries</b>								
<b>Mackenzie Delta</b> — <b>Tuktoyaktuk Peninsula</b>								
Gulf Mobil Parsons F-09	F-09-69-00-133-30	Suspended	Gas & Condensate	Lower Cretaceous	Sandstone	20-01-71	19-04-72	17.2 MMCFD DST
Gulf Mobil Parsons N-10	N-10-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	14-02-73	29-05-73	FT 34 MMCFD
*Gulf Mobil Parsons L-37	L-37-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	26-12-76	02-04-77	22.8 MMCFD DST
*Gulf Mobil Parsons P-41	P-41-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	29-12-76	05-04-77	6.75 MMCFD DST
Gulf Mobil Parsons A-44	A-44-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	09-04-75	22-07-75	15 MMCFD DST
Gulf Mobil Parsons P-53	P-53-69-00-133-30	Suspended	Gas & Condensate	Lower Cretaceous	Sandstone	22-12-73	09-04-74	8.3 MMCFD DST
Gulf Mobil Parsons O-27	O-27-69-00-133-30	Suspended	Gas	Cretaceous	Sandstone	23-03-74	30-08-74	
Gulf Mobil Parsons L-43	L-43-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	10-12-75	04-03-76	27.7 MMCFD DST
Gulf Mobil Parsons N-17	N-17-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	18-12-75	13-04-76	22.5 MMCFD DST
Gulf Mobil Parsons D-20	D-20-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	21-04-76	22-11-76	20.5 MMCFD DST
Gulf Imp. Shell Reindeer F-36	F-36-69-10-134-30	Suspended	Gas	Tertiary	Sandstone	13-03-73	05-06-73	4.87 MMCFD DST
Gulf Mobil Siku C-11	C-11-69-10-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	26-12-75	22-03-76	31 MMCFD Calc.
Gulf Mobil Siku A-12	A-12-69-10-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	14-04-76	26-07-76	47 MMCFD (est) DST
*Gulf Mobil Siku E-21	E-21-69-10-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	17-04-77	21-06-77	28.9 MMCFD DST
Gulf Imp. Shell Titalik K-26	K-26-69-10-135-00	Abandoned	Gas	Tertiary	Sandstone	17-10-72	20-02-73	14.05 MMCFD DST
Gulf Mobil Ya Ya A-28	A-28-69-20-134-30	Suspended	Gas	Tertiary	Sandstone	28-02-74	06-07-74	11.3 MMCFD DST
Gulf Mobil Ya Ya P-53	P-53-69-20-134-30	Suspended	Gas	Tertiary	Sandstone	08-12-72	20-03-73	8.1 MMCFD DST
IOE Taglu G-33	G-33-69-30-134-45	Suspended	Gas	Tertiary	Sandstone	13-04-71	18-08-71	28.7 MMCFD DST
IOE Taglu C-42	C-42-69-30-134-45	Suspended	Condensate & Gas	Eocene	Sandstone	30-04-72	18-11-72	24.5 MMCFD Calc.
IOE Taglu W. P-03	P-03-69-30-135-00	Suspended	Gas	Eocene	Sandstone	12-12-71	29-03-72	6.3 MMCFD Max. flow rate



IOE Taglu D-43	D-43-69-30-134-45	Suspended	Gas	Eocene	Sandstone	23-03-73	11-09-73	AOF 30.3 MMCFD
IOE Mallik L-38	L-38-69-30-135-00	Abandoned	Potential Gas	Tertiary	Sandstone	24-12-71	05-04-72	8.84 MMCFD CCT. calc.
*Imp. Taglu H-54	H-54-69-30-134-45	Suspended	Gas	Tertiary	Sandstone	02-12-76	05-04-77	2.5 MMCFD DST
Imp. Netserk F-40	F-40-69-40-135-45	Suspended	Gas	—	—	08-11-75	09-05-76	—
Shell Kumak K-16	K-16-69-20-135-00	Suspended	Gas	Tertiary	Sandstone	23-02-75	13-07-75	11.9 MMCFD DST
*Shell Kumak E-58	E-58-69-30-135-00	Suspended	Gas	Tertiary	Sandstone	28-02-77	08-06-77	17.1 MMCFD DST
Shell Niglintgak H-30	H-30-69-20-135-15	Suspended	Gas (DST)	Tertiary	Sandstone	24-10-72	07-04-73	15.9 MMCFD DST
Shell Niglintgak B-19	B-19-69-20-135-15	Suspended	Gas	Tertiary	Sandstone	18-10-75	22-02-76	8.6 MMCFD DST
Sun et al Garry P-04	P-04-69-30-135-30	Suspended	Oil & Gas	Tertiary	—	25-08-75	05-01-76	17.4 MMCFD DST
<b>Beaufort Sea</b> Dome Hunt Nektoralik K-59	K-59-70-30-136-00	Abandoned	Oil & Gas	—	—	08-08-77	17-10-77	—
Dome et al Ukalerk C-50	C-50-70-10-132-30	Abandoned	Gas	—	—	19-07-77	03-10-77	—

## 8. Interior Plains

**Great Slave Plain** — gas pools have been discovered in porous dolomites and limestones of Middle Devonian age.

Briggs Rabbit Lake No. 1	O-16-61-00-118-45	Potential Gas Well	Gas Discovery	Sulphur Point	Limestone	04-02-55	30-03-55	AOF 2 MMCFD (EST)
Briggs Rabbit Lake No. 2	B-07-61-00-118-45	Potential Gas Well	Gas Dev.	Sulphur Point	Limestone	09-02-57	14-03-57	AOF 6 MMCFD (EST)
Home Signal CSP Celibeta No. 2 H-78	H-78-60-10-122-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	26-12-59	24-03-60	AOF 8 MMCFD
H.B. Cameron Hills A-05	A-05-60-10-117-30	Potential Gas Well	Gas Discovery	Slave Point Sulphur Point	Limestone Dolomite	28-01-68	24-02-68	DST 8.2 MMCFD
H.B. Pan Am S. Island R. M-41	M-41-60-10-121-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	03-02-64	23-04-64	DST 5.7 MMCFD
H.B. Amoco S. Island R. M-52	M-52-60-10-121-00	Abandoned	Gas Dev.	Slave Point	Limestone	21-01-73	21-02-73	DST 1.3 MMCFD
Pacific Amoco Tathlina N-18	N-18-60-20-118-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	28-01-73	19-02-73	DST 1.8 MMCFD
Shell H.B. Grumbler G-63	G-63-60-20-115-45	Abandoned	Potential Gas Discovery	Slave Point	Limestone	14-02-69	16-03-69	DST 10 MMCFD
Sun Netla C-07	C-07-60-50-122-45	Potential Gas Well	Gas Discovery	Sulphur Point	Limestone	20-01-61	05-04-61	AOF 24 MMCFD
Texaco Bovie Lake J-72	J-72-60-10-122-45	Potential Gas Well	Gas Discovery	Nahanni	Dolomite	06-01-70	18-01-70	DST 2.6 MMCFD
Union Pan Am Trainor C-39	C-39-60-20-120-30	Potential Gas Well	Gas Discovery	Sulphur Point	Carbonate	29-01-65	15-03-65	DST 8 MMCFD

**Great Bear Plain** — no discoveries to date.

**Mackenzie Plain** — oil is still produced at Norman Wells from the Devonian Kee Scarp formation and additional hydrocarbon shows have been encountered in the Cretaceous and Silurian age of formations of this *province*.

#### Crude Oil Discoveries

##### Norman Wells Oil Field

Northwest Discovery No. 1	P-37-65- 20-126-45	Abandoned	Oil Discovery	Devonian Canol	Fractured Shale	14-04-20	1923	12 bbl/day
Northwest Discovery No. 2	P-37-65- 20-126-45	Abandoned	Oil Discovery	Kee Scarp (Givetian)	Limestone	07-24	08-24	75 bbl/day

74 additional wells were drilled to develop field.

**Peel Plain** — no discoveries here as yet, but hydrocarbon shows have been encountered in Lower Devonian formations.

**Anderson Plain** — one gas discovery has been made at Tedji Lake, and several other hydrocarbon shows have been encountered.

Ashland et al Tedji Lake F-24	F-24-67- 50-126-45	Suspended	Gas	Basal Cambrian	Sandstone	13-02-74	31-03-74	DST 4.5 MMCFD
----------------------------------	-----------------------	-----------	-----	-------------------	-----------	----------	----------	---------------

9. Liard Plateau and Range — gas is being produced in this *province* at the Beaver River (B.C. portion) and Pointed Mountain fields from dolomites of the Nahanni Formation of Middle Devonian age. The Beaver River field (Y.T. portion) produced gas from Mississippian sands. Gas has also been discovered at North Beaver River and La Biche.

#### Northwest Territories

C.P.O.G. et al La Biche F-08	F-08-60- 40-124-30	Suspended	Gas Discovery	Middle Devonian	Argillaceous Limestone	25-02-71	19-03-71	DST 2.9 MMCFD
Pan Am Pointed Mountain G-62	G-62-60- 30-123-45	Gas Well	Gas Dev.	Middle Devonian Carbonate	Dolomite	09-07-68	23-06-69	Flow back 12 MMCFD
Pan Am Pointed Mountain K-45	K-45-60- 30-123-45	Gas Well	Gas Dev.	Middle Devonian Carbonate	Dolomite	15-09-67	08-05-68	AOF 75.6 MMCFD
Pan Am Pointed Mountain O-46	O-46-60- 30-123-45	Gas Well	Gas Dev.	Devonian Nahanni	Dolomite	29-03-69	02-10-71 Extended Standby	AOF 19.43 MMCFD
Pan Am Pointed Mountain P-53	P-53-60- 30-123-45	Gas Well	Gas Discovery	Devonian Nahanni	Dolomite	06-02-66	22-02-67	AOF 70.22 MMCFD
Amoco B-2 Pointed Mountain F-38	F-38-60- 30-123-45	Gas Well	Gas Dev.	Devonian Nahanni	Dolomite	22-08-72	07-10-73	AOF 29 MMCFD
Amoco Pointed Mountain A-55	A-55-60- 30-123-45	Gas Well	Gas Dev.	Devonian Nahanni	Dolomite	01-03-74	08-08-74	Production tested 4.5 MMCFD
<b>Yukon Territory</b>								
Canadian Southern et al North Beaver YT I-27	I-27-60- 10-124-00	Suspended	Extension Test Gas Well	Middle Devonian	Carbonate	24-03-63	29-09-64	AOF 1.5 MMCFD
*Columbia Gas et al Kotaneelee H-38	H-38-60- 10-124-00	Suspended	Gas Dev.	Middle Devonian	Carbonate	06-04-77	29-10-77	Production tested 21 MMCFD
Pan Am Beaver River YT G-01	G-01-60- 10-124-15	Gas Well	Gas Producer	Missis- sippian & Nahanni	Sandstone and Carbonate	12-06-68	10-03-69	AOF 6.77 MMCFD AOF 39.54 MMCFD

10. Eagle Plain — significant hydrocarbon shows have been encountered, but no commercially interesting discoveries have been reported.

Canoe River Chance YT J-19	J-19-66- 10-137-30	Potential Gas & Oil	Gas & Oil Discovery	Carbon- iferous Hart River	Conglom- eratic Sandstone	14-12-67	17-02-68	DST 6.52 MMCFD
Socony Mobil WM Chance YT G-08	G-08-66- 10-137-30	Potential Oil Well	Gas & Oil Discovery	Cretaceous Carbon- iferous Hart River	Sandstone Conglo- meratic Sandstone	04-12-64	15-02-65	DST 3.3 MMCFD 1180' oil

Socony Mobil WM Birch YT B-34	B-34-66- 10-136-45	Potential Gas Well	Gas Discovery	Carbon- iferous Hart River	Conglo- meratic Sandstone	04-08-64	06-08-65	DST 7.3 MMCFD
Socony Mobil WM Blackie YT No. 1 M-59	M-59-66- 00-137-00	Potential Gas Well	Gas Discovery	Permian	Conglo- meratic Sandstone	11-12-63	27-03-64	DST 2.8 MMCFD
WM Chance YT No. 1 M-08	M-08-60- 10-137-30	Potential Gas or Oil Well	Gas & Oil Discovery	Cretaceous Carbon- iferous Hart River	Sandstone Conglo- meratic Sandstone	30-05-59	25-05-60	11/64" Choke 5 MMCFD 10.5 bbl/d

---

11. Peel Plateau — shows of hydrocarbons have been observed.

12. Old Crow Basin — no hydrocarbon discoveries have been made.

13. Whitehorse Plain — no hydrocarbon discoveries have been made.

---



## Report of the Reserves Committee of the Canadian Petroleum Association

The Reserves Committee presented its annual report on Canada's liquid hydrocarbon and natural gas reserves as of December 31, 1977. Its estimates of *proved* and *probable* remaining reserves are shown in the tabulations below. Included in the tabulations are gas reserves for the Mackenzie Delta, which were first included in 1974, and for the Arctic Islands, first included in 1975. The Mackenzie Delta reserves are rated at 6.7 trillion cubic feet (up 1.6 TCF from 1975); the Arctic Islands reserves are rated at 13.5 trillion cubic feet; 0.7 trillion cubic feet are included for the southern Territories, relatively unchanged from 1975.

**Table 2 — Canadian Petroleum Association Reserves**

<i>Crude Oil</i> (Thousand Barrels)	Proved	Probable
<i>Remaining Reserves as of Dec. 31, 1977</i>		
Yukon and Northwest Territories	37 717	67 717
Canada	5 970 872	7 049 761
<i>Net Change during 1977</i>		
Yukon and Northwest Territories	-1 000	-1 000
Canada	-286 210	-381 636

### *Natural Gas Liquids* (Thousand Barrels)

<i>Remaining Reserves as of Dec. 31, 1977</i>		
Yukon and Northwest Territories	38 566	53 117
Canada	1 912 900	2 077 381
<i>Net Change during 1977</i>		
Yukon and Northwest Territories	3 950	-427
Canada	366 795	349 937

### *Total Liquid Hydrocarbons* (Thousand Barrels)

<i>Remaining Reserves as of Dec. 31, 1977</i>		
Yukon and Northwest Territories	76 283	120 834
Canada	7 883 772	9 127 142

<i>Net Change during 1977</i>		
Yukon and Northwest Territories	2 950	-1 427
Canada	80 585	-31 699

### *Marketable Natural Gas* (Million Cubic Feet @ 14.65 psia and 60° F)

<i>Remaining Reserves as of Dec. 31, 1977</i>		
Yukon and Northwest Territories	5 372 786	17 759 128
Canada	59 472 026	78 031 771

<i>Net Change during 1977</i>		
Yukon and Northwest Territories	547 668	935 468
Canada	1 190 084	1 671 939

## Summary of Oil and Natural Gas Resources of Canada

The Department of Energy, Mines and Resources has estimated the likelihood of existence of oil and gas resources in the various regions of Canada. These estimates are reproduced in Table 3\* and are based on data available at the end of 1975. No data changes have been published since then.

**Table 3 — Summary of oil and natural gas resources of Canada — 1975\*\***

(Remaining reserves, discovered resources and undiscovered potential)

<i>Region</i>	<i>Likelihood of Existence</i>		
	"High"	50 / 50 Chance	"Low"
	90%	50%	10%
	Probability	Probability	Probability
<i>Oil Resources</i> (billions of barrels)			
Atlantic Shelf South . . . . .	1.2	1.9	3.0
Labrador-East			
Newfoundland Shelf . . . .	1.7	2.6	4.5
Northern Stable Platform			
Basins . . . . .	0.01	0.6	3.2
St. Lawrence Lowlands . . .	0.04	0.09	0.2
Western Canada . . . . .	10.9	11.7	13.5
Mainland Territories . . . . .	0.3	0.5	1.0
Mackenzie Delta-Beaufort			
Sea . . . . .	4.3	6.9	12
Sverdrup Basin . . . . .	1.1	2.0	4.0
Arctic Fold Belts . . . . .	0.5	1.8	4.3
Total Canada (Accessible Regions) . . . . .	25	30	43

*Note:* These columns do not total arithmetically to the Canada totals because individual curves must be summed using a statistical technique described elsewhere in the Geological Survey Report.

\*Extracted from *Oil and Natural Gas Resources of Canada, 1976*, Report EP-77-1, Department of Energy, Mines and Resources.

\*\*Prepared by Geological Survey of Canada

<i>Region</i>	<i>Gas Resources</i> (trillions of cubic feet)		
Atlantic Shelf South . . . . .	8.6	13.2	20
Labrador-East			
Newfoundland Shelf . . . .	18	26.7	45
Northern Stable Platform			
Basins . . . . .	0.4	2.3	12
St. Lawrence Lowlands . . .	0.7	1.4	3.2
Western Canada . . . . .	89	97	107
Mainland Territories . . . . .	6.0	9.7	20
Mackenzie Delta-Beaufort			
Sea . . . . .	39	60	99
Sverdrup Basin . . . . .	21	40	80
Arctic Fold Belts . . . . .	2.9	11	26
Total Canada (Accessible Regions) . . . . .	229	277	378

# Land Administration

The Policy Statement of May, 1976 announced jointly by the Minister of Energy, Mines and Resources, and the Minister of Indian Affairs and Northern Development contained elements of proposed legislation to be tabled before Parliament in 1977. Although tabling of the proposed legislation (Bill C-20, the Canada Oil and Gas Act) was delayed until December 20, 1977, amendments to the existing Canada Oil and Gas Land Regulations were made effective in August, 1977, and had an impact on certain existing land holdings late in the year. The elements of the policy statement introduced in Regulation form are discussed in more detail below under "Canada Oil and Gas Land Regulations". No new disposals of oil and gas rights were held during the year and thus the acreage held under permits and leases continued to decline.

The decline in permit and lease holdings amounted to about 20 per cent of the number held in 1976. This decrease reflects both the maturing of permit holdings due to the passage of time, as well as shifts of exploratory effort away from less costly and less prospective areas and into the more expensive, less accessible areas. (see Table 4 and Figures 2 and 3). However, continued interest, primarily in the Mackenzie Delta, Beaufort Sea and Arctic Islands areas, is shown by the increasing number of holdings being held through their full statutory and additional renewal terms. These holdings are now progressing through discretionary renewal periods authorized by the Regulations based on annual escalating work requirements designed to achieve an escalated assessment of oil and gas potential. About 29 million acres are included in this category. During 1978, about 15 million permit acres will reach the end of statutory terms.

Following the amendments to the Regulations in August, one significant effect was the re-commencement of issuance of oil and gas leases from expiring permits. Lands held under applications for leases may now be, at the applicant's option; 1) issued as leases, 2) converted to special renewal permits, or 3) surrendered outright. Some of these lease applications have been held since 1972, and at times represented a total of up to 10 million acres. As a result, although few leases were issued during the latter part of the year, most of the applications on hand will be dealt with during 1978, and current applications will be handled on expiry of permits. About 2.4 million acres were the subject of lease applications during 1977. Acreage subject to lease applications is not included in the totals in Table 4.

**Table 4 —** Number of issued permits and leases, and relevant acreage as of December 31, 1977

<i>Area</i>	<i>Permits</i>	<i>Acreage</i>	<i>Leases</i>	<i>Acreage</i>
NWT mainland	1 042	45 934 083	456	2 664 919
Yukon mainland	324	14 061 236	50	200 109
Arctic Islands	3 142	149 685 865	6	26 499
Arctic coast marine	661	29 615 949	Nil	Nil
Total	5 169	239 297 133	512	2 891 527



Fig. 2  
Area held under Oil & Gas Permit  
Yukon Territory and Northwest Territories

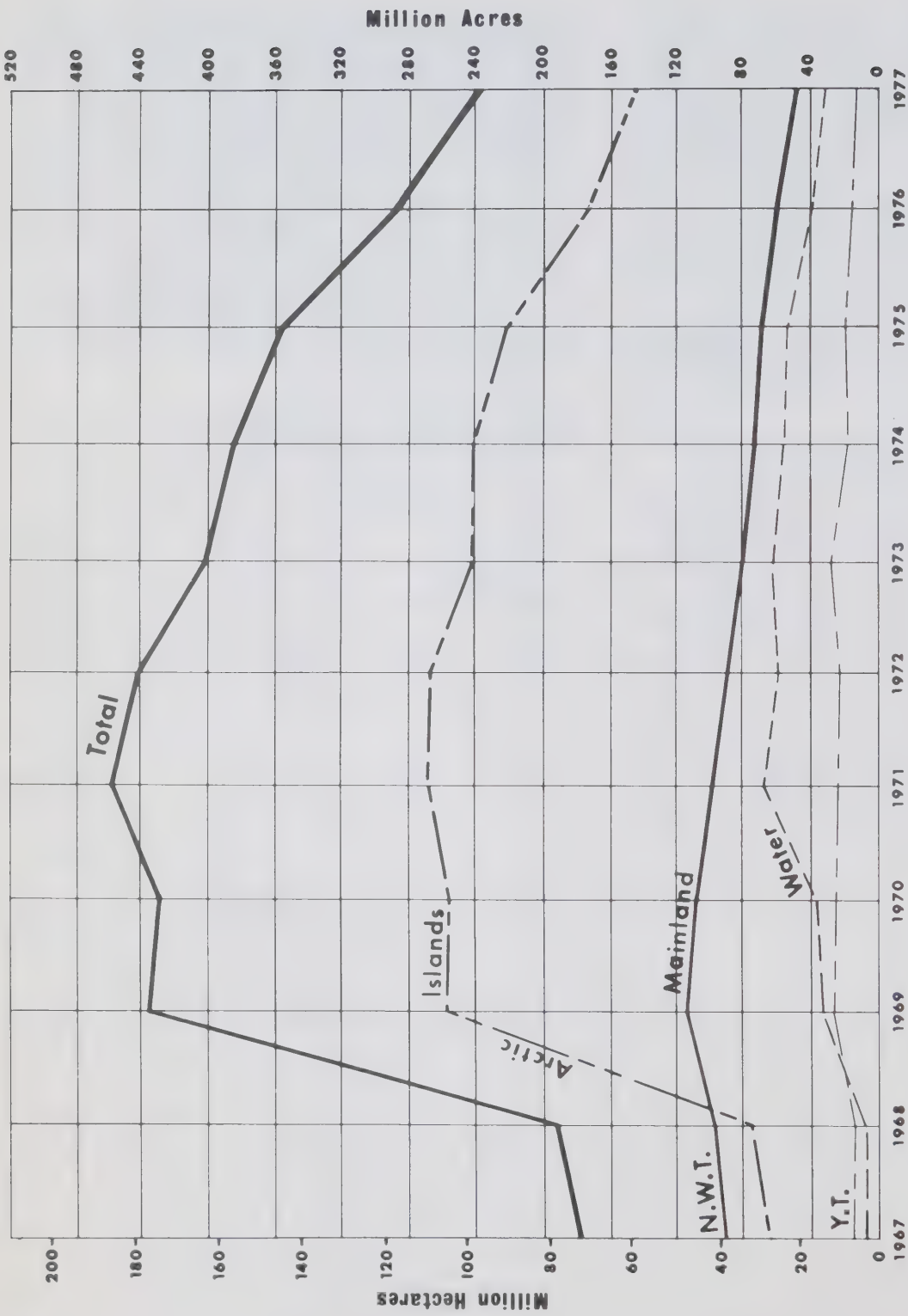
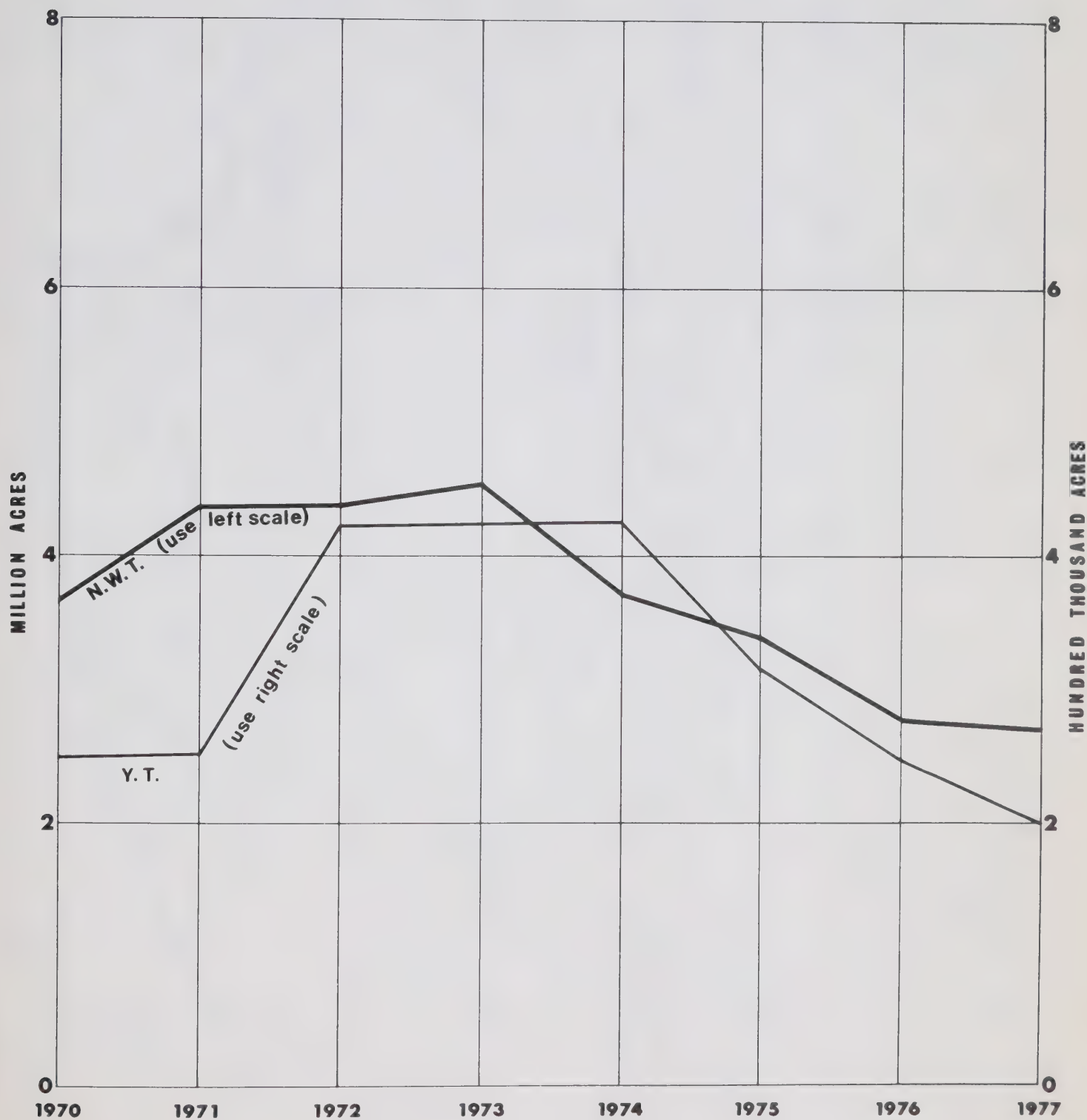





Fig. 3  
**Acreage under Lease by Year**  
Yukon Territory and Northwest Territories



Canada Lands are administered by the Department of Indian Affairs and Northern Development north of the heavy line. Offshore areas elsewhere administered by the Department of Energy, Mines and Resources

**Fig. 4**  
**Permit Term and Work Requirement Zones**  
**North of 60°**

 **\$ 2.65/Ac.**  
 **\$ 2.70/Ac.**  
 **\$ 2.90/Ac.**

Scale in miles

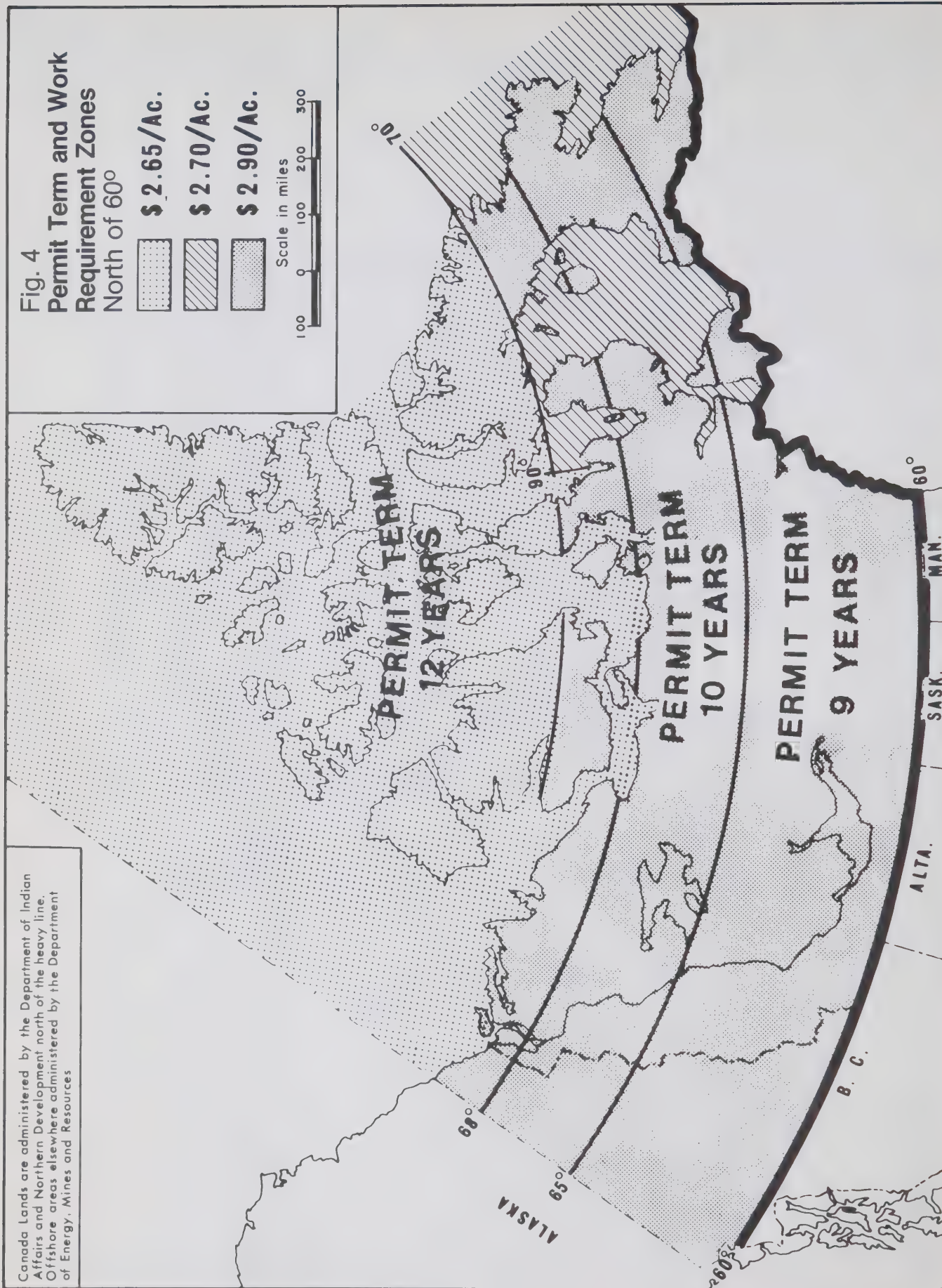
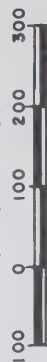
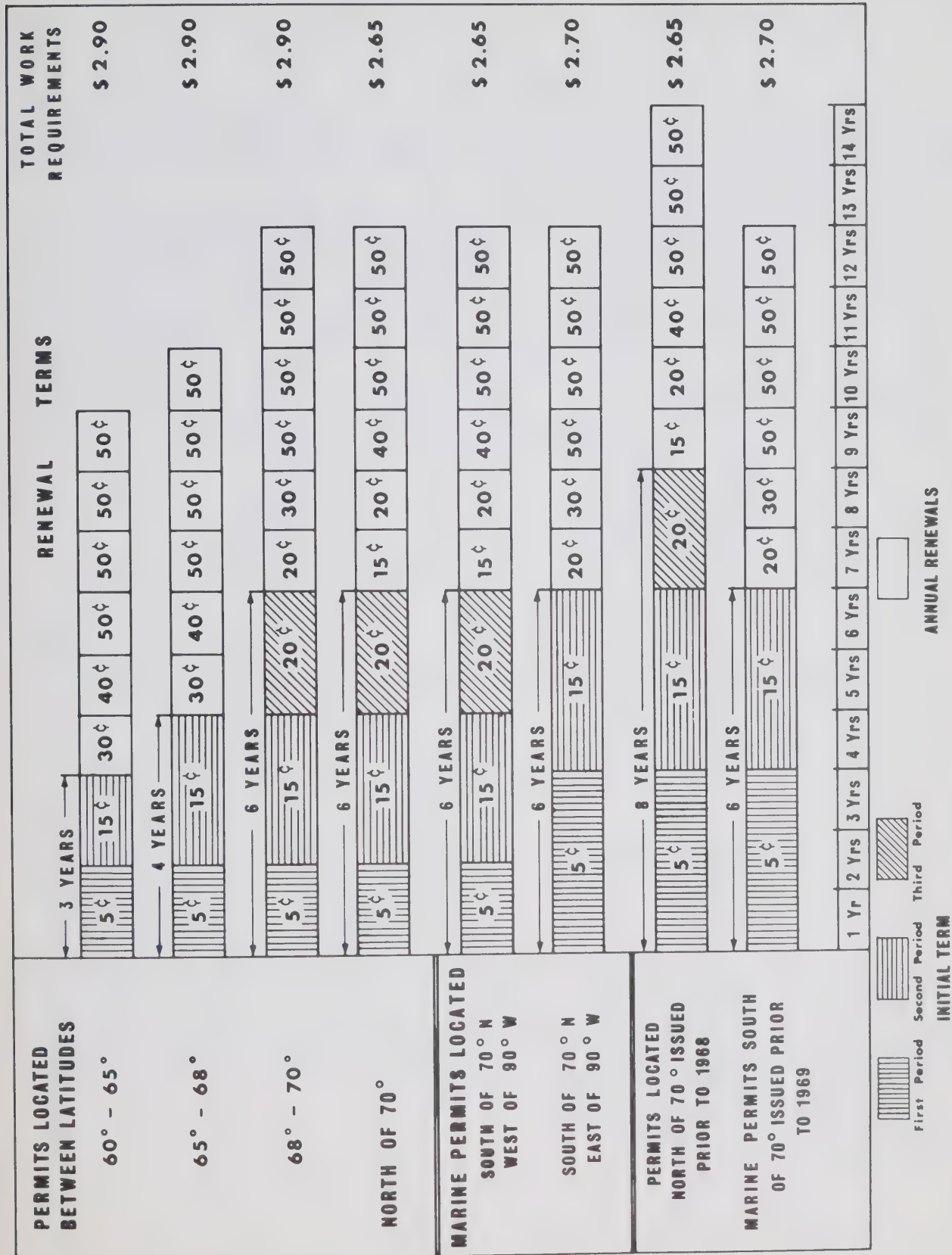




Fig. 5

# Permit Terms and Deposit Requirements — Per Acre Yukon Territory and Northwest Territories



# Act and Regulations

## Bill C-20, Canada Oil and Gas Act

On December 20, 1977, the Minister of Energy, Mines and Resources, tabled before the House of Commons *Bill C-20*, an Act to regulate the disposition and development of oil and gas rights. This proposed legislation embodies the legislative elements referred to in a Statement of Policy dated May 1976 announced jointly by the Minister of Energy, Mines and Resources, and the Minister of Indian Affairs and Northern Development. In accordance with the National Energy Strategy, the new regime is designed to stimulate increased exploration in order to furnish the necessary information upon which an early assessment of Canada's hydrocarbon reserves can be made. The legislative elements include fiscal and land holding incentives, combined with provisions for increased governmental control over the timing, direction, and the rate and level of exploration, development and production activities. The legislation will also provide increased benefits for, and participation by Canadian firms including Petro-Canada, engaged in development of Canada's resources. In addition, the Statement provides for the introduction of a Progressive Incremental Royalty system, supplementary to basic royalties on production, in order to ensure a fair economic return to the Canadian people from resource development. The legislation not only continues the accepted principle of minimizing front-end loading charges but also the concept of unitary development whereby the industry is assured of rights to produce all hydrocarbon reserves within its development areas.

The impact of the new legislation on existing permits and leases will be mainly to achieve an acceleration in the pace of exploratory activity. Some of its other features are:

- increased work obligations,
- shorter confidential periods for reports of exploratory projects,
- increased Ministerial authority to order the drilling of wells and commencement of production; to determine product prices; to require submission of contracts and agreements respecting transfers and interests in oil and gas rights as well as supply contracts; to establish levels of minimum Canadian participation in resource ownership and to provide preferences for Petro-Canada in the acquisition of Crown Reserves and certain existing contracts.

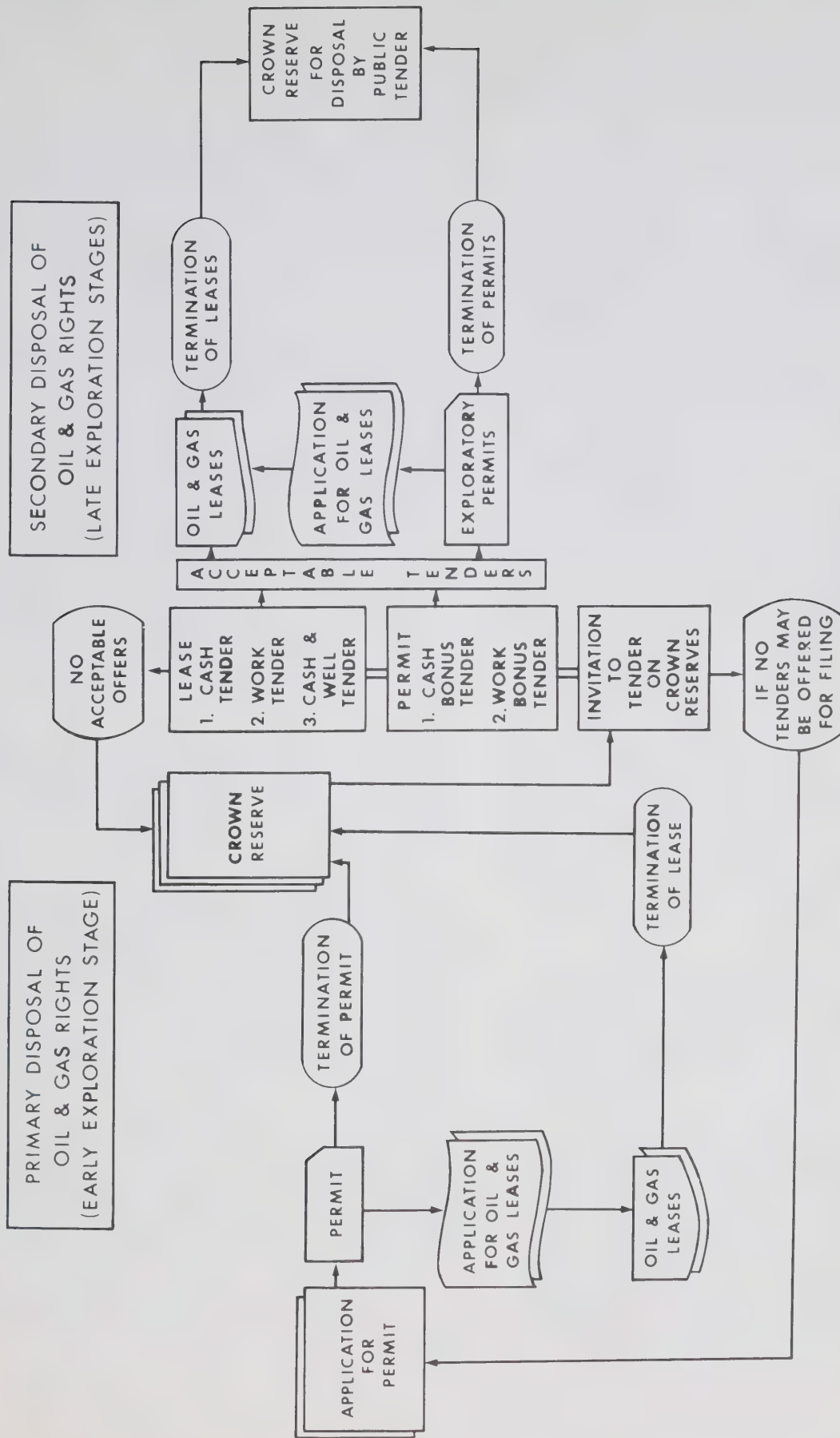
It is anticipated that enactment of the legislation, together with promulgation of complementary regulations, will occur during 1978.

## Canada Oil and Gas Land Regulations

The terms for permits already issued under the existing Canada Oil and Gas Land Regulations are summarized in Figures 4 and 5. Figure 4 shows the permit term in years, including the renewals granted subsequent to the initial term and the total per-acre minimum work requirements to be met during the permit life. The minimum deposit and work requirements for each period of the permit life are illustrated in Figure 5. Figure 6 shows diagrammatically the flow of Canada Oil and Gas Lands under the present Regulations and through the various disposal methods.

Because of the delay in tabling Bill C-20, the *Canada Oil and Gas Act*, until December of 1977, the Ministers of Energy, Mines and Resources and of Indian Affairs and Northern Development recommended amendments to the existing Canada Oil and Gas Land Regulations. These amendments were promulgated in July, 1977. Following a discussion with the major industry Associations in Calgary in September, further amendments were made effective in November. This series of amendments was designed to establish some of the principles contained in the Policy Statement of May, 1976 and which are also contained in Bill C-20. Some of the significant elements of the revised Regulations include replacing the oil and gas permit with an exploration agreement as a vehicle for future disposals of oil and gas rights, issuance of oil and gas leases or reversion to exploratory permit at the option of the holder of the expiring permit, and establishing the right of Petro-Canada to acquire Crown reserves and to participate in certain existing exploratory permits. Also included is a method of determining the actual beneficial ownership of certain oil and gas rights by Canadians. At year end, the processes for issuance of leases were well underway. In 1978 the anticipated enactment of Bill C-20 and its complementary regulations will completely replace the present Canada Oil and Gas Land Regulations.

Fig. 6  
Flow Diagram of Disposal of Oil and Gas Rights





### **Canada Oil and Gas Geophysical Regulations**

A joint project was initiated by the Departments of Indian and Northern Affairs (INA) and Energy, Mines and Resources (EMR) to draft the Canada Oil and Gas Geophysical Regulations for promulgation under the *Canada Oil and Gas Production and Conservation Act*. Sections of the regulations will pertain to onshore and offshore geophysical operations on Canada Lands.

The primary intent of these regulations will be to ensure:

- the safety of personnel working on geophysical crews;
- the protection of the living resources of the onshore and marine areas to be surveyed;
- the quality and type of geophysical data submitted to the relevant resource organizations.

In 1977 industry comments were incorporated into the final draft which was then submitted to the Legal Division for drafting by the Legislative Division of the Justice Department.

### **Canada Oil and Gas Drilling Regulations**

A further joint Project was initiated by INA and EMR to draft the Canada Oil and Gas Drilling Regulations for promulgation under the *Canada Oil and Gas Production and Conservation Act*. Sections of the regulations pertaining to the drilling of both onshore and offshore wells were completed in draft form and reviewed with Industry.

General INA/EMR/Industry consensus has been reached and the latest revised draft is now under legal review by the Department prior to submission to the Privy Council for its legal review. It is anticipated that the *Canada Oil and Gas Drilling Regulations* will be promulgated during 1978.

### **Canada Oil and Gas Production Regulations**

The joint INA/EMR draft Production and Pipeline Regulations, completed in 1975, were sent to Industry for review and comments in 1976. Joint meetings were held in the first and second quarters of 1977. Consensus has been reached on all but a few items and a final review will be made in June 1978. Legal review will commence in the fourth quarter of 1978.

A set of *Offshore Structures* regulations is in draft form and is being prepared for submission to Industry for comments in the last quarter of 1978.

### **Land Use Regulations**

In June, 1970, amendments to the Territorial Lands Act permitting the implementation of Territorial Land Use Regulations were passed by Parliament.

These Regulations were promulgated on November 4, 1971. They provide authority for designating Land Management Zones in the Yukon Territory and Northwest Territories. Within these zones most major land use operations, including resource exploration and development, require Land Use Permits. These stipulate the measures to be followed by the operator to protect the environment. Permit conditions are established on the recommendation of an interdepartmental and intergovernment Land Use Advisory Committee, following consultations with any northern community whose interests may be affected.

As a result of amendments to the Land Use Regulations, a new land-management zone was established effective November, 1975 in order that the Land Use Permit system should apply through the Northwest Territories.

Further revised Land Use Regulations were submitted for the Minister's approval at the end of 1976. The amended Regulations will apply to both large and small land use operations to ensure that every operation which could create a significant environmental impact is controlled by permit. Equally important, sufficient time is provided to northern communities to comment fully on applications for permits which might affect their interest.

In the Northwest Territories, the Land Use Regulations are administered by the Regional Directorate, Northern Natural Resources and Environment Branch in Yellowknife, and in the Yukon Territory by the Regional Directorate of Northern Natural Resources and Environment Branch in Whitehorse.



Imperial Oil Refinery at Norman Wells. (Courtesy Pacific Western Airlines)

### **Metrication in the Oil and Gas Industry**

The Federal Government has announced its intention to introduce omnibus bills in each of the next two years to facilitate Canadian conversion to SI (Système International) measurements. The Oil and Gas Industry (in conjunction with the provincial and federal governments) put forward its plan for the metrication of all aspects of its work and this was approved by the Metric Commission on December 8, 1976. As of January 1, 1979, all transactions of the Industry at all levels — operational, business and governmental — will be required to be expressed in SI units.

Much of the operational work, drilling and construction for example, can already be easily converted but difficulties and confusion could result in dealing with business and government departments. To make personnel throughout the whole Industry thoroughly familiar with the Metric System and competent in its use, the Metrication Training Program, begun in 1976, will continue through 1978. This program, requested and financed by the Canadian Petroleum Industry, is entitled: *Metrication and SI units for the Oil and Gas Industry: a learning program for scientific and technical professionals*. It consists of books and audio tapes suitable for use by either individuals or groups.

Liaison regarding metric conversion is being maintained with the American Petroleum Institute (API) and the American National Metric Council (ANMC) and an exchange of representatives between Canada and the ANMC has been approved.

# Revenues

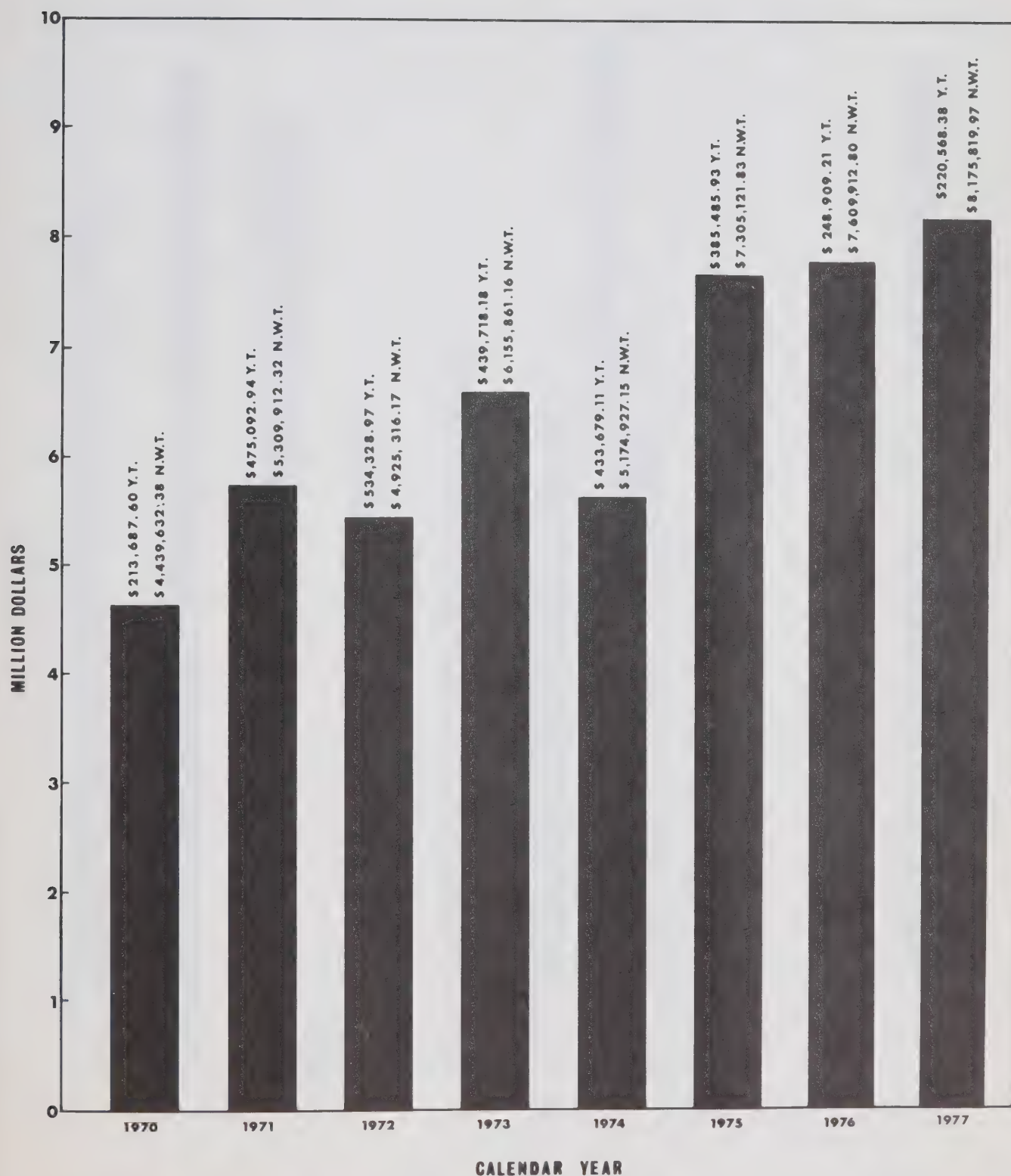
While no sales of oil and gas rights were held in 1977, revenues from northern operations during the calendar year approximated \$ 8.4 million (Table 5 and Figure 7), up \$ 0.5 million from 1976.

Total revenues from all sources for the fiscal year 1977-78 approximated \$ 8.5 million (Table 6 and Figure 8), down \$ 0.9 million from 1976-77, due to the decrease in royalties collected and to a reduction in rental income due to the withdrawal of previous years' applications and the resulting refund of lease rentals.

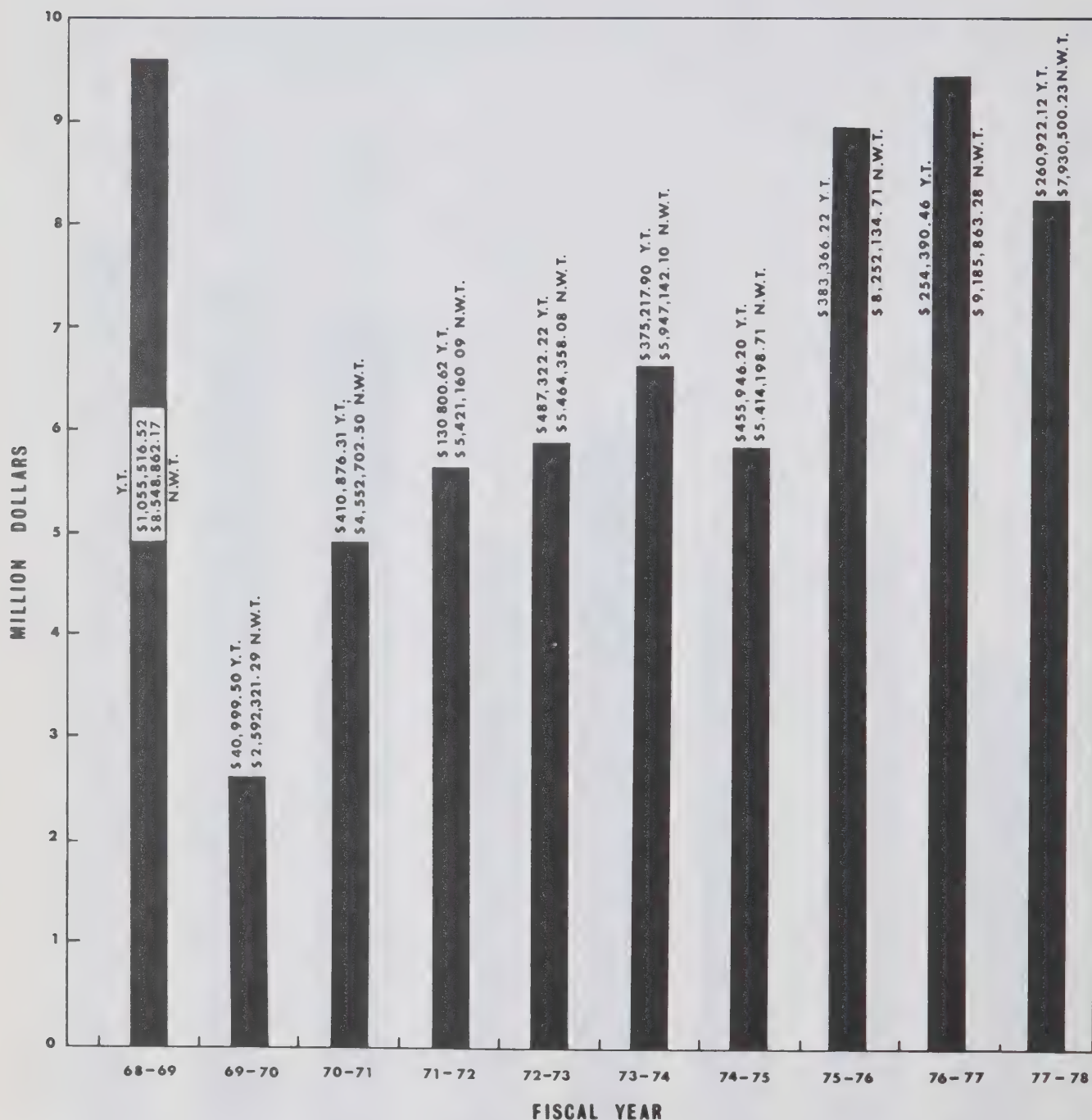
Figure 9 shows the annual value of work bonus for oil and gas work bonus blocks and permits. The cumulative value of work bonus to the end of 1969 was approximately \$ 59 million. No sales have been held since then.



Fig. 7  
**Gross Revenue — Oil & Gas**  
**from Fees, Forfeitures,**  
**Royalties, Rentals & Sale of Maps**  
**Calendar Year**  
**Yukon Territory and Northwest Territories**

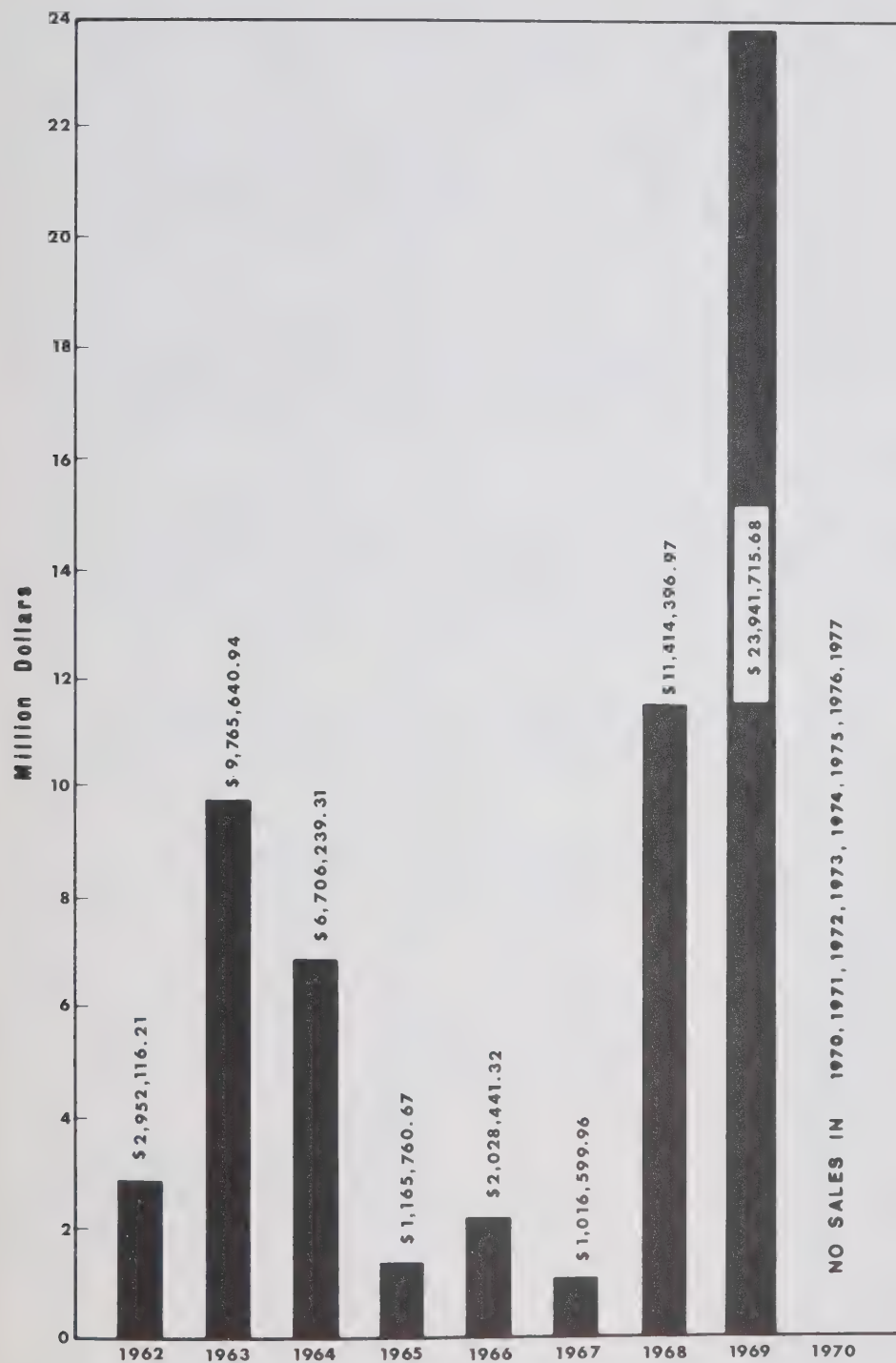


**Fig. 8**  
**Gross Revenue — Oil & Gas**  
**from Fees, Forfeitures,**  
**Royalties, Rentals & Sale of Maps**  
**Fiscal Year**  
**Yukon Territory and Northwest Territories**



**Fig. 9**  
**Value of Work Bonus Tenders — Oil & Gas**  
**Yukon Territory and Northwest Territories**

NOTE: Cumulative Value End of Dec. 1969  
 \$ 58,990,911.06





**Table 5 — Gross Revenue, Oil and Gas (calendar year) 1971 to 1977.**  
**Northwest Territories**

Year	Licence Fee	Permit Fee	Transfer Fee	Lease Fee	Rentals	Royalties	Forfeitures	Cash Bonus	Misc.	Total
1971	\$ 4 900.00	\$395 500.00	\$ 55 806.52	\$ 1 130.00	\$ 4 070 722.82(1)	\$ 301 562.00	\$ 478 609.95	—	\$ 1 681.03	\$ 5 309 912.32
1972	4 525.00	231 500.00	37 795.00	3 150.00	4 136 291.41(2)	259 276.21	251 701.28	—	1 077.27	4 925 316.17
1973	4 100.00	183 500.00	30 235.00	1 950.00	4 836 714.92(3)	734 962.91	359 957.30	—	4 441.03	6 155 861.16
1974	3 625.00	73 220.00	44 900.00	4 140.00	3 812 555.16(4)	1 186 071.90	47 550.09	—	2 865.00	5 174 927.15
1975	2 750.00	4 000.00	10 005.00	3 970.00	3 684 559.54(5)	3 425 965.83(6)	172 517.93	—	1 353.53	7 305 121.83
1976	2 425.00	—	14 635.00	4 670.00	2 675 065.79(7)	4 688 996.80	219 104.46	—	5 015.75	7 609 912.80
1977	2 600.00	—	12 635.00	6 320.00	3 266 775.28	4 778 130.10	105 853.49	—	3 506.10	8 175 819.97
Total	\$24 925.00	\$887 720.00	\$206 011.52	\$25 330.00	\$26 482 684.92	\$15 374 965.75	\$1 635 294.50	—	\$19 939.71	\$44 656 871.40

(1) Permit Rental — Special Renewals (\$1 528 189.50)  
(2) Permit Rental — Special Renewals (\$1 002 534.75)  
(3) Permit Rental — Special Renewals (\$1 444 172.50)  
(4) Permit Rental — Special Renewals (\$ 34 574.00)  
(5) Permit Rental — Special Renewals (\$ 4 617.50)  
(6) Bonus Royalties from Sept. 1972 to Dec. 1975 (\$445 831.42)  
(7) Refund of Previous Years' Rentals — Lease Application Withdrawn (\$966 422.50)

#### Yukon Territory

1971	—	\$ 4 750.00	\$ 360.00	\$ 275.00	\$ 423 944.50(8)	\$ 4 256.88	\$ 41 506.56	—	—	\$ 475 092.94
1972	—	750.00	75.00	2 950.00	507 079.00	23 474.97	—	—	—	534 328.97
1973	—	3 500.00	—	—	417 142.38	19 075.80	—	—	—	439 718.18
1974	—	—	75.00	180.00	409 060.00	24 364.11	—	—	—	433 679.11
1975	—	—	3 610.00	90.00	204 281.25	177 504.78	—	—	—	385 485.93
1976	—	—	45.00	50.00	104 353.00	144 461.21	—	—	—	248 909.21
1977	—	—	1 075.00	110.00	155 065.25	64 318.13	—	—	—	220 568.38
Total	—	\$ 9 000.00	\$ 5 240.00	\$ 3 655.00	\$ 2 220 925.38	457 455.78	\$ 41 506.56	—	—	\$ 2 737 782.72

(8) Permit Rental — Special Renewals (\$24 960.00)

#### Total Revenues 1971 to 1977

1971	
1972	\$ 5 459 645.14
1973	\$ 6 595 579.34
1974	\$ 5 608 606.26
1975	\$ 7 690 607.76
1976	\$ 7 858 822.01
1977	\$ 8 396 388.35
Total	\$41 609 648.86

Table 6 — Gross Revenue, Oil and Gas (Fiscal Year)

Northwest Territories

Fiscal Year	Licence Fee	Permit Fee	Transfer Fee	Lease Fee	Rentals	Royalties	Forfeitures	Cash Bonus	Misc.	Total
1970-71	\$ 5 800.00	\$101 508.60	\$ 60 921.52	\$ 1 450.00	\$ 3 396 332.82	\$ 255 259.00	\$ 729 500.39	—	\$ 1 930.17	\$ 4 552 702.50
1971-72	5 550.00	400 000.00	52 105.00	1 110.00	4 182 655.72(1)	301 562.00	476 328.66	—	1 848.71	5 421 160.09
1972-73	2 550.00	234 500.00	41 965.00	3 200.00	4 493 538.70(2)	303 427.08	384 624.03	—	553.27	5 464 358.08
1973-74	4 100.00	189 500.00	19 440.00	2 170.00	4 808 931.18(3)	729 372.07	188 606.71	—	5 022.14	5 947 142.10
1974-75	3 125.00	31 220.00	41 680.00	4 810.00	3 899 447.35(4)	1 283 911.85	147 713.98	—	2 290.53	5 414 198.71
1975-76	1 320.00	—	8 955.00	4 040.00	3 718 493.34(5)	4 352 171.61(6)	165 716.01	—	1 438.75	8 252 134.71
1976-77	3 450.00	—	14 870.00	3 960.00	*4 343 465.73(8)	4 672 663.83	142 315.07	—	5 138.65	9 185 863.28
1977-78	825.00	—	15 670.00	6 490.00	3 488 769.99	4 624 080.06	105 853.49	—	2 811.20	8 244 499.74
Total	\$26 720.00	\$956 728.60	\$255 606.52	\$27 230.00	\$32 331 634.83	\$16 522 447.50	\$2 340 658.34	—	\$21 033.42	\$52 482 059.21

Yukon Territory

Fiscal Year	Licence Fee	Permit Fee	Transfer Fee	Lease Fee	Rentals	Royalties	Forfeitures	Cash Bonus	Misc.	Total
1970-71	—	\$4 750.00	\$ 25.00	\$ 190.00	\$ 364 604.75	—	\$41 306.56	—	—	\$ 410 876.31
1971-72	—	—	410.00	85.00	120 688.25(7)	\$ 9 617.37	—	—	—	130 800.62
1972-73	—	750.00	—	2 950.00	453 756.50	24 865.72	—	—	—	482 322.22
1973-74	—	3 500.00	—	—	357 644.38	14 073.52	—	—	—	375 217.90
1974-75	—	—	75.00	180.00	400 627.00	55 064.20	—	—	—	455 946.20
1975-76	—	—	3 635.00	90.00	184 243.25	195 397.97	—	—	—	383 366.22
1976-77	—	—	1 095.00	80.00	130 779.75	122 435.71	—	—	—	254 390.46
1977-78	—	—	—	140.00	230 641.15	29 216.00	1 845.62	—	—	261 842.77
Total	—	\$9 000.00	\$5 240.00	\$3 715.00	\$2 242 985.03	\$450 670.49	\$43 152.18	—	—	\$2 754 762.70

Grand Total Revenues

1970-71	\$ 4 963 578.81
1971-72	5 551 960.71
1972-73	5 946 680.30
1973-74	6 322 360.00
1974-75	5 870 144.91
1975-76	8 635 500.93
1976-77	9 440 253.74
1977-78	8 506 342.51
Total	\$55 236 821.91

- (1) Permit Renewals (Rental) — Special (\$1 607 455.50)
- (2) Permit Renewals (Rental) — Special (\$1 163 492.75)
- (3) Permit Renewals (Rental) — Special (\$1 283 214.50)
- (4) Permit Renewals (Rental) — Special (\$ 34 574.00)
- (5) Permit Renewals (Rental) — Special (\$ 4 617.50)
- (6) Bonus Royalties from Sept. 1972 to Jan. 1976 (\$498,456.45)
- (7) Refunds of Previous Years' Lease Rentals Application (\$966 425.50)
- (8) Permit Renewals (Rental) — Special (\$24 960.00)

# Exploration, Discoveries and Drilling Operations

## Exploration

### ***Geological and photogeological surveys***

There was very little work carried on in this field during 1977 (see Fig. 10).

### ***Seismic land surveys***

A total of 32 seismic crew months, concentrated in the Mackenzie Delta and Arctic Islands, were reported in 1977 (a decrease of 25 per cent over 1976). Detailed seismic work was carried out by Gulf Oil Canada Limited, Imperial Oil Limited, Chevron Canada Limited, and Petro-Canada Exploration Ltd., in the Mackenzie Delta. There was one land seismic participation program in 1977 — United Geophysical on Banks Island. In the Arctic Islands, major seismic programs were continued by Panarctic Oils Ltd. on Melville and Cameron Islands and in the inter-island areas on behalf of the Arctic Islands Exploration Group. The surveys covered a distance of 3 562 miles (5 732.5 km), a decrease from the four previous years (see Table 7 and Figs. 10, and 11).

### ***Seismic marine surveys***

Marine seismic surveys were carried out by Imperial Oil and Dome Petroleum in the Beaufort Sea, by Hudson's Bay Oil and Gas, Mobil Oil and Gas, Phillips Petroleum and Panarctic Oils Ltd. in the inter-island areas of the Arctic Archipelago, and by Imperial Oil, Shell Canada and Aquitaine in the Baffin Bay-Davis Strait areas. Participation-type marine seismic surveys were carried out by Eureka Exploration Ltd. in the Beaufort Sea and Baffin Bay-Davis Strait areas, and by Geophysical Service Inc., in the Beaufort Sea and Arctic Archipelago. Sun Oil Company completed the last year of the three-year, \$40 million, Arctic Island Offshore Group combined marine and on-ice seismic programs. These surveys covered a distance of 7 586 miles (12 208.5 km), a decrease from previous years (see Table 7 and Fig. 11).



MOT icebreaker offshore at Resolute Bay. (Courtesy Panarctic Oils Ltd.)

Exploration activity is expected to decline further in 1978 because of the decrease of drilling activity in the Delta area and of the need to complete environmental surveys before proceeding with drilling in the Lancaster Sound and the Davis Strait areas in 1979. Further seismic programs in marine areas are being deferred until some drilling has been carried out.



### Discoveries

During 1977 a small but significant oil discovery was made in the Beaufort Sea, and a number of gas pools were found in the Northwest Territories.

The gas discoveries were made at Dome Hunt Nektoralik K-59 and Dome Gulf et al Ukalerk C-50 in the Beaufort Sea, at Gulf Mobil Parsons L-37 and P-41, Gulf Mobil Siku E-21, IOE Taglu H-54 and Shell Kumak E-58 in the Mackenzie Delta, and at Columbia Gas et al Kotaneelee, Y.T. H-38 in the Liard Plateau of the southern Yukon Territory.

### Drilling

Drilling activities as a whole decreased in 1977 in the area North of 60. (see Figs. 12 to 16 inclusive). Table 8 and Figs. 15 and 16 indicate the number of wells drilled North of 60 in 1977 together with their total footage.

The operations were concentrated in four areas: Mackenzie Delta, Mackenzie Bay, Beaufort Sea, and in the Sverdrup Basin of the Arctic Islands. Imperial Oil and Sun Oil continued drilling operations from man-made islands in Mackenzie Bay, and Panarctic Oils continued drilling operations from man-made ice-islands in the inter-island areas of the Arctic Islands. In 1977, the two ice-island wells were drilled in the Hecla and Drake areas off Sabine Peninsula, Melville Island.

In the Beaufort Sea, three deep wells were drilled in the 1977 season. The Dome Hunt Nektoralik K-59 well was drilled to 9 154 feet. Oil and gas zones were tested and the well was abandoned. The Hunt Dome Kopanoar M-13 well was drilled to 9 164 feet and suspended for re-entry in 1978. The Dome Gulf et al Ukalerk C-50 well was drilled to 7 561 feet when severe casing problems, up-hole between 600 and 1 100 feet K.B., resulted in it being abandoned before total depth was reached. A gas zone was tested in this well. Two other wells were spudded and conductor casing was set: at 1 300 feet on the Dome Kaglulik A-75 well and at 1 760 feet on the Dome Nerlerk M-98 well.

In 1978, drilling is expected to continue in the off-shore areas of the Beaufort Sea at six new locations. Three of the six wells may be drilled to total depth. A *Sun Arctic* drilling program, operated by Panarctic Oils, in the Arctic Islands involving six companies and expected to cost more than \$80 million over the next four years, commenced in late 1977. A total of 25 wells, both on-shore and off-shore should be drilled.

Early in 1978, Panarctic Oils will drill an offshore well in the Drake gas field and complete it as a production well by laying a string of pipe through the ice. Production tests will be carried out over a 2-month period to test the feasibility of producing offshore wells from a remote land station. If these tests prove successful, then longer step-outs from shore may be undertaken over the next several years.

Fig. 10  
**Exploration Activity**  
 Yukon Territory and Northwest Territories

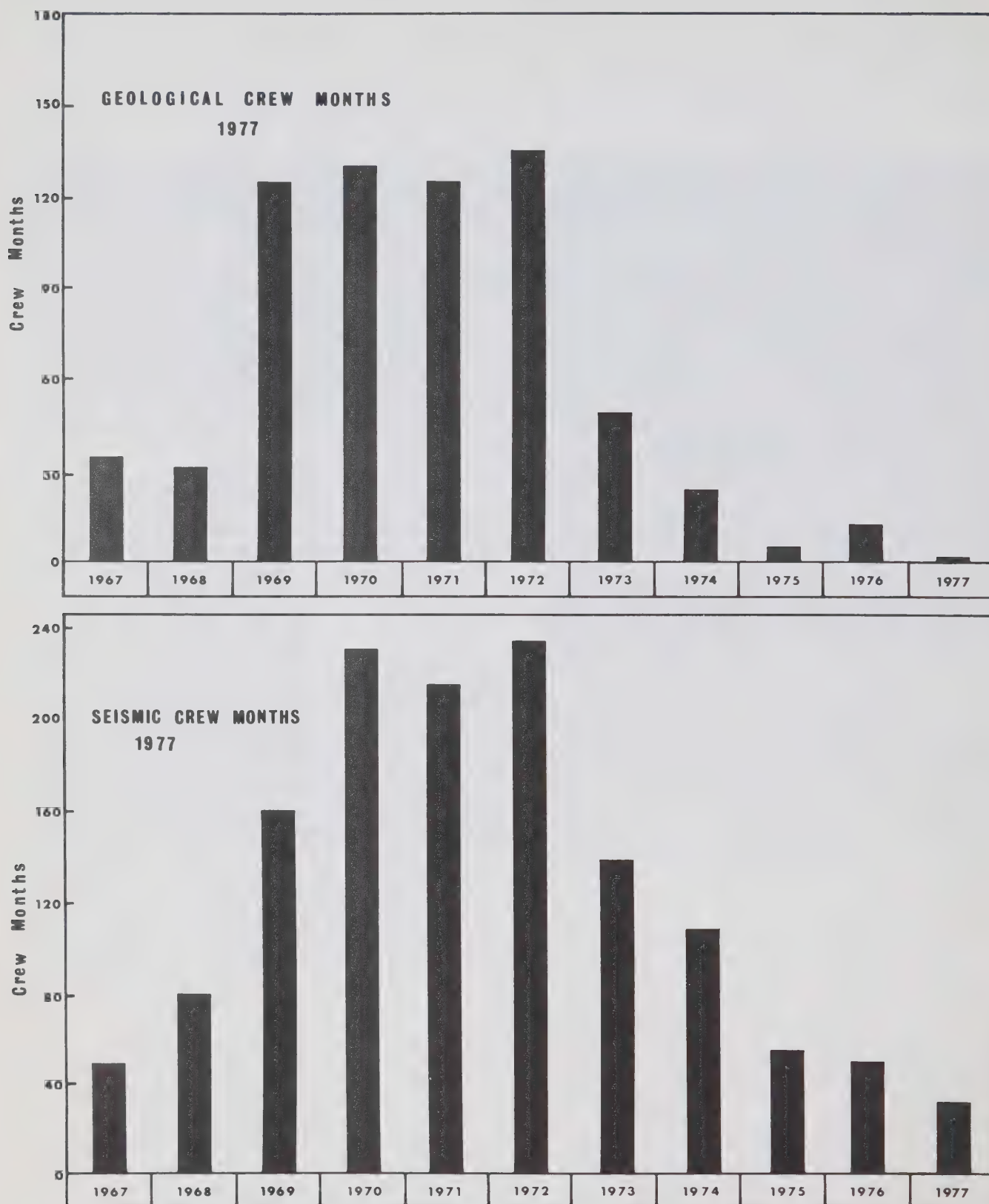


Fig. 11  
**Exploration Activity**  
Yukon Territory and Northwest Territories

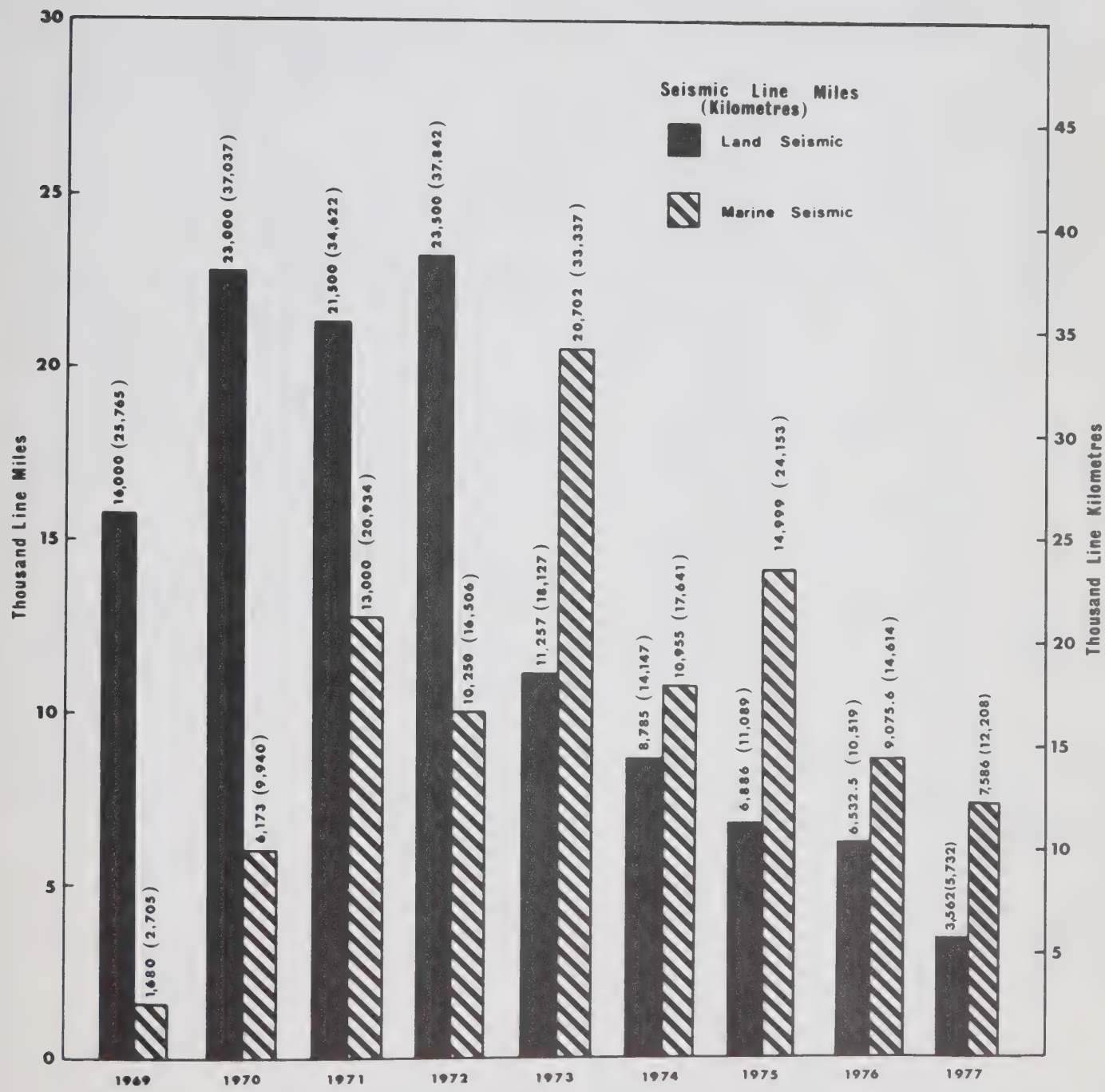




Table 7 — 1973-1977 Exploration Survey Statistics

	Yukon Territory	N.W.T. Mainland	Mackenzie Delta	Beaufort Sea	Arctic Islands and Surrounding Water	Baffin Bay — Davis Strait	Total
<i>Geological</i>							
<i>Crew Months</i>							
1973	3.0	9.0	0	0	37.0	1.0	50.0
1974	3.5	1.5	4.5	0	15.5	0	25.0
1975	0	0	0	0	3.5	1.0	4.5
1976	4.0	1.5	1	0	5.5	1.0	13.0
1977	0	0	1.5	0	1.0	0	2.5
<i>Land Seismic</i>							
<i>Crew Months</i>							
1973	10.0	25.0	42.0	4.0	58.0	0	139.0
1974	3.0	27.0	41.0	2.0	37.0	0	110.0
1975	0	14.5	10.5	0.1	32.0	0	57.1
1976	0	3.0	18.5	1.0	29.5	0	52.0
1977	0	0.5	10.0	0	21.5	0	32.0
<i>Seismic Line</i>							
<i>Miles (Kilometres)</i>							
<i>Land</i>							
1973	611 (984)	1 152 (1 855)	3 473 (5 593)	470 (757)	5 551 (8 939)	0	11 257 (18 127)
1974	121 (195)	1 932 (3 111)	3 229 (5 200)	75 (121)	3 428 (5 520)	0	8 785 (14 147)
1975	0	1 572 (2 531)	679 (1 093)	9 (14)	4 626 (7 449)	0	6 886 (11 089)
1976	0	3 375 (5 435)	2 082 (3 353)	77 (124)	4 036 (6 499)	0	6 532 (10 519)
1977	0	48 (77)	504.5 ( 811.9)	0	3 009.5 (4 843.3)	0	3 562 (5 732.5)
<i>Marine</i>							
1973	0	18 (29)	0	4 603 (7 412)	5 006 (8 061)	11 075 (17 834)	20 702 (33 337)
1974	0	0	0	1 724 (2 776)	4 159 (6 697)	5 072 ( 8 167)	10 955 (17 641)
1975	0	0	0	2 568 (4 135)	3 341 (5 380)	9 090 (14 638)	14 999 (24 153)
1976	0	0	42.6 (69)	2 804 (4 515)	1 336 (2 151)	4 893 ( 7 879)	9 075.6 (14 614)
1977	0	0	0	2 901 (4 668.7)	2 119 (3 410.2)	2 566 ( 4 129.6)	7 586 (12 208.5)

**Fig. 12**  
**Wells Completed or Abandoned in 1977**

**LEGEND**

☼ Gas Well

● Oil Well

☼ Suspended

☼ Dry and Abandoned

3,300' Total Depth

Number of Wells Drilled In 1977 - 27 Footage Drilled In 1977 - 277,144

100 miles

50

0

161 kilometres

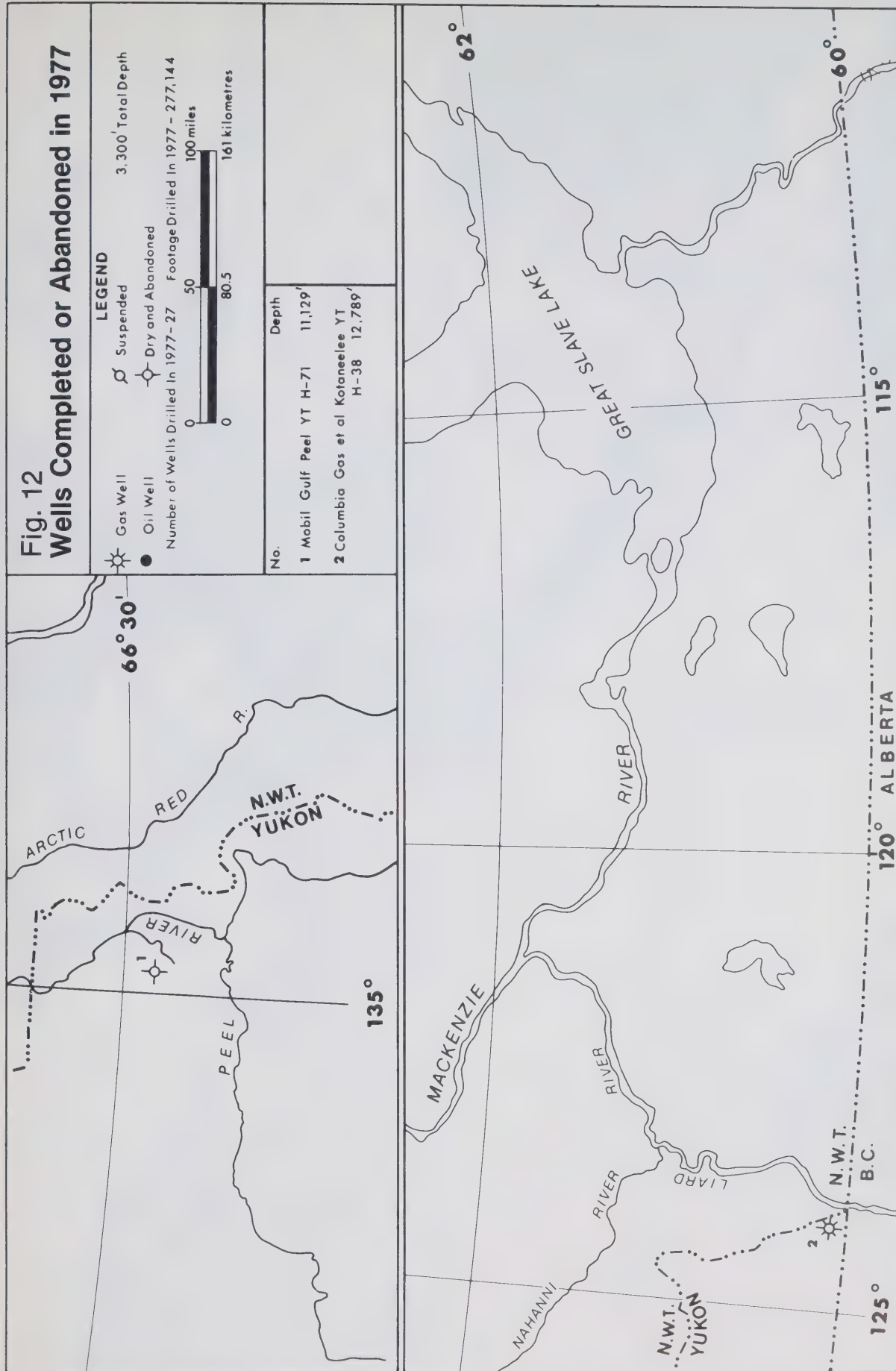
80.5

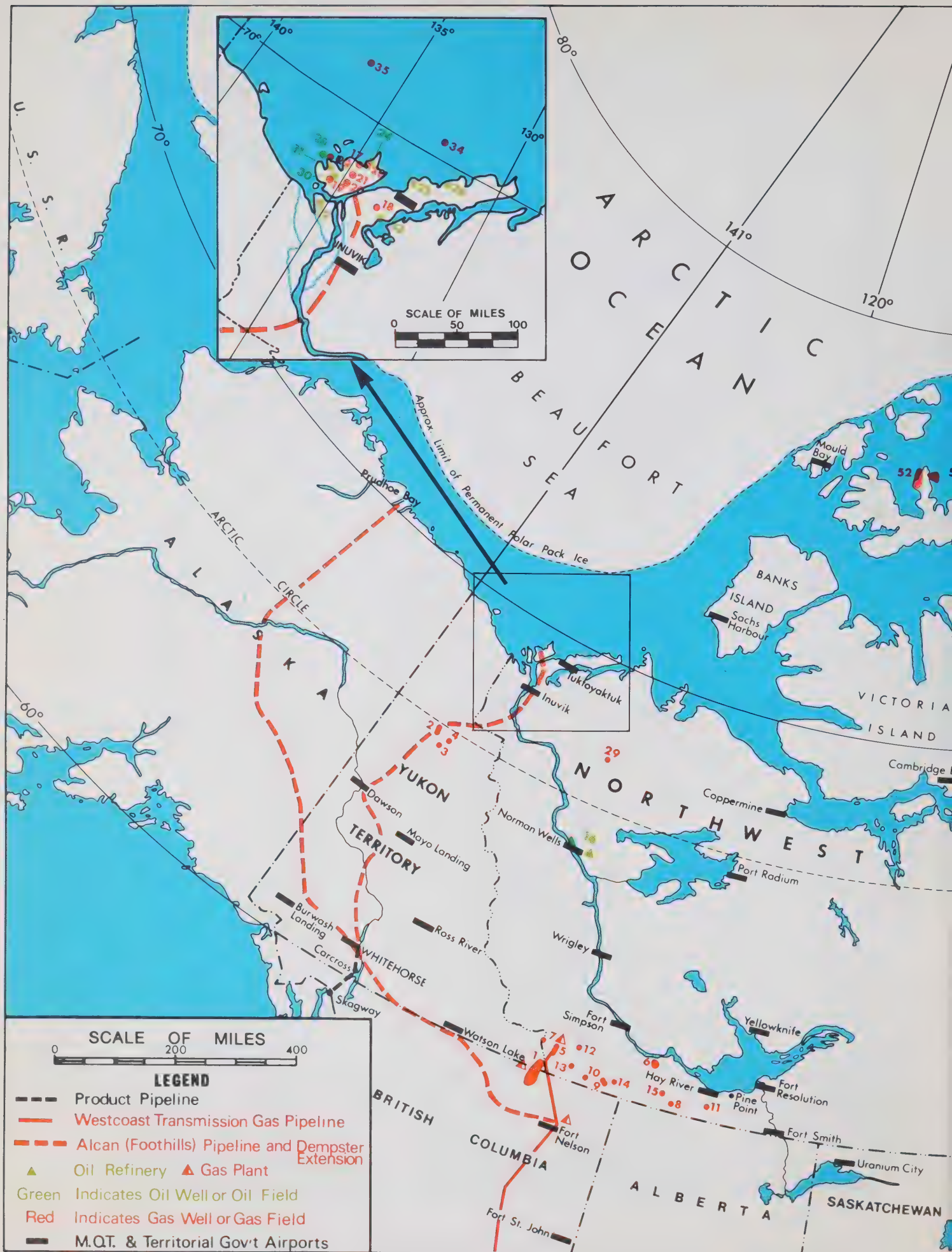
0

No. Depth

1 Mobil Gulf Peel YT H-71 11,129'

2 Columbia Gas et al Kotaneelee YT  
H-38 12,789'









# Oil and Gas Fields and Discoveries

## YUKON TERRITORY

- 1 Beaver River Gas Field
- 2 Chance Gas Field
- 3 Socony Mobil et al Blackie No. 1
- 4 Socony Mobil et al Birch Y.T. B-34

## NORTHWEST TERRITORIES





- 5 Pointed Mountain Gas Field
- 6 Rabbit Lake Gas Field
- 7 C.P.O.G. et al LaBiche F-08
- 8 H.B. Cameron Hill A-05
- 9 S. Island River Gas Field
- 10 Home Signal Celibeta H-78
- 11 Shell H.B. Grumbler G-63
- 12 Sun Netla C-07
- 13 Texaco Bovie Lake J-72
- 14 Union Pan Am. Trainer Lake C-39
- 15 Pacific Amoco Tathlina N-18
- 16 Norman Wells Oil Field
- 17 Taglu Gas Field
- 18 Parsons Gas Field
- 19 Gulf Imperial Shell Titalik K-26
- 20 Gulf Imperial Shell Reindeer F-36
- 21 Gulf Mobil Ya Ya P-53 A-28 Gas Pools
- 22 Shell Niglintgak H-30 M-19
- 23 Imperial I.O.E. Mallik L-38
- 24 Imperial Ivik J-26
- 25 I.O.E. Mayogiak J-17
- 26 I.O.E. Atkinson H-25
- 27 Shell Kugpiq O-13
- 28 Imp. Adgo F-28
- 29 Ashland Tedji Lake F-24
- 30 Kumak Oil and Gas Field
- 31 Garry Oil and Gas Field
- 32 Imp. Netserk F-40
- 33 Gulf Mobil Kamik D-48
- 34 Dome Hunt Nektoralik K-59
- 35 Dome Gulf et al Ukalerk C-50

## ARCTIC ISLANDS

- 51 Drake Point Gas Field
- 52 Hecla Gas Field
- 53 King Christian Gas Field
- 54 Panarctic Tenneco et al Kristoffer Bay B-06
- 55 Dome Arctic Ventures Wallis K-62
- 56 Thor Gas Field
- 57 Panarctic Romulus
- 58 Dome Sutherland O-23
- 59 Panarctic Bent Horn N-72, A-02
- 60 Panarctic Jackson Bay G-16A

**Fig. 13**  
**Wells Completed or Abandoned in 1977**

**LEGEND**

-  Gas Well  
 Oil Well  
 Suspended  
 Dry and Abandoned
- 3,300' Total Depth  
 Number of Wells Drilled In 1977 - 27    Footage Drilled in 1977 - 277,144  
 0    50    100 miles  
 0    80.5    161 kilometres

No.	Depth	No.	Depth
1 Chev. Can. PEX et al Fish R. B-60	11,490	10 Gulf Mobil Siku E-21	11,245
2 Chevron Canada Upluk A-42	9,162	11 Imp Arnak L-30	14,840
3 Dome Hunt Nektoralik K-59	9,154	12 Imp IOE Kannerk G-42	8,139
4 Dome Gulf et al Ukalerk C-50	7,561	13 Imp Delta 5 Kurk M-39	10,200
5 Gulf Mobil Kamik F-38	11,700	14 Imp IOE Umiak N-10	15,793
6 Gulf Mobil Ogruknang M-31	14,532	15 IOE Taglu H-54	9,166
7 Gulf Mobil Parsons L-37	12,996	16 Shell Kumak E-58	5,100
8 Gulf Mobil Parsons P-41	11,665	17 Shell Tullugak K-31	9,600
9 Gulf Mobil Sadene D-02	6,095	18 Sun BVX et al Unark L-24 A	12,188

BEAUFORT SEA

ALASKA

N.W.T.  
Y.T.

INUVIK

3

11

18

2

13

14

15

16

17

10

5

7

6

135°

140°

130°

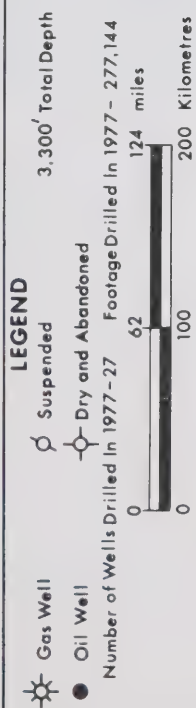
125°

140°

145°

70°

**Fig. 14**  
**Wells Completed or Abandoned in 1977**



No.	Depth
1 Panarctic Charles Point G-07	12,653'
2 Panarctic et al Depot I. C-44	8,757
3 Panarctic NE. Drake P-40	3,390
4 Panarctic S.W. Hecla C-58	4,000
5 Panarctic Sophie Point G-19	12,440
6 Panarctic et al W. Bent Horn I-01A	10,760
7 Panarctic W. Bent Horn M-12	10,600





**Table 8 — Wells Abandoned or Completed in 1977.** A total of 27 wells drilled and completed or abandoned is recorded for 1977. The total footage was 277,144 feet. (D & A indicates *dry and abandoned*, J & A indicates *junked and abandoned* and P & A indicates *plugged and abandoned*).

#### Northwest Territories — Arctic Islands

Name of Well	Spudded	Completed	Status	Total Depth (In Feet)
Panarctic Charles Point G-17 G-17-76-30-103-00	10-10-76	07-02-77	D & A	12 653
Panarctic et al Depot Island C-44 C-44-76-30-114-00	19-04-77	10-06-77	D & A	8 757
Panarctic N.E. Drake P-40 P-40-76-30-107-00	01-02-77	12-03-77	D & A	3 390
Panarctic S.W. Hecla C-58-76-20-108-00	03-04-77	29-04-77	D & A	4 000
Panarctic Sophie Point G-19 G-19-76-20-103-00	29-05-77	30-09-77	D & A	12 440
Panarctic et al of W. Bent Horn I-01A I-01-76-30-104-00	30-11-76	18-05-77	D & A	10 760
Panarctic W. Bent Horn M-12 M-12-76-30-104-00	04-03-77	03-06-77	D & A	10 600

#### Northwest Territories — Mainland

Chevron Canada PEX et al Fish R B-60 B-60-68-40-136-00	21-06-77	31-10-77	D & A	11 490
Chevron Canada Upluk A-42 A-42-69-30-135-15	15-01-77	02-04-77	D & A	9 162
Dome Hunt Nektoralik K-59 K-59-70-30-136-00	21-09-76	17-10-77	Gas Discovery	9 154
Dome Gulf et al Ukalerk C-50 C-50-70-10-132-30	18-07-77	03-10-77	Gas Discovery	7 561
Gulf Mobil Kamik F-38 F-38-69-00-133-15	13-12-76	13-03-77	D & A	11 700
Gulf Mobil Ogruknang M-31 M-31-69-00-134-15	18-04-77	01-08-77	D & A	14 532
Gulf Mobil Parsons L-37 L-37-69-00-133-30	26-12-76	02-04-77	Susp Gas Well	12 996
Gulf Mobil Parsons P-41 P-41-69-00-133-30	29-12-76	05-04-77	Susp Gas Well	11 665
Gulf Mobil Sadene D-02 D-02-69-00-126-45	08-03-77	06-05-77	D & A	6 095
Gulf Mobil Siku E-21 E-21-69-10-133-30	17-04-77	21-06-77	Susp Gas Well	11 245
Imp Arnak L-30 L-30-69-50-133-45	05-10-76	16-03-77	D & A	14 840
Imp IOE Kannerk G-42 G-42-70-10-131-00	30-03-77	14-05-77	D & A	8 139
Imp Delta 5 Kurk M-39 M-39-69-10-135-15	16-12-76	09-03-77	D & A	10 200
Imp 10E Umiak N-10 N-10-69-30-134-15	13-04-77	02-10-77	D & A	15 793
10E Taglu H-54 H-54-69-30-134-45	02-12-76	05-04-77	Susp Gas Well	9 166
Shell Kumak E-58 E-58-69-20-135-00	28-02-77	08-06-77	Susp Gas Well	5 100
Shell Tullugak K-31 K-31-69-10-135-00	18-10-77	05-01-77	D & A	9 600
Sun BVX et al Unark L-24A L-24-69-40-134-30	19-10-70	08-05-77	D & A	12 188

#### Yukon Territory

Mobil Gulf Peel YT H-71 H-71-66-30-134-30	05-02-77	12-06-77	D & A	11 129
Columbia Gas et al Kotaneelee Y.T. H-38 H-38-60-10-124-00	06-04-77	29-10-77	Gas Well	12 789

Fig. 15  
**Wells Drilled**  
 Yukon Territory and Northwest Territories  
 Number of Wells Drilled to end 1977 (893)

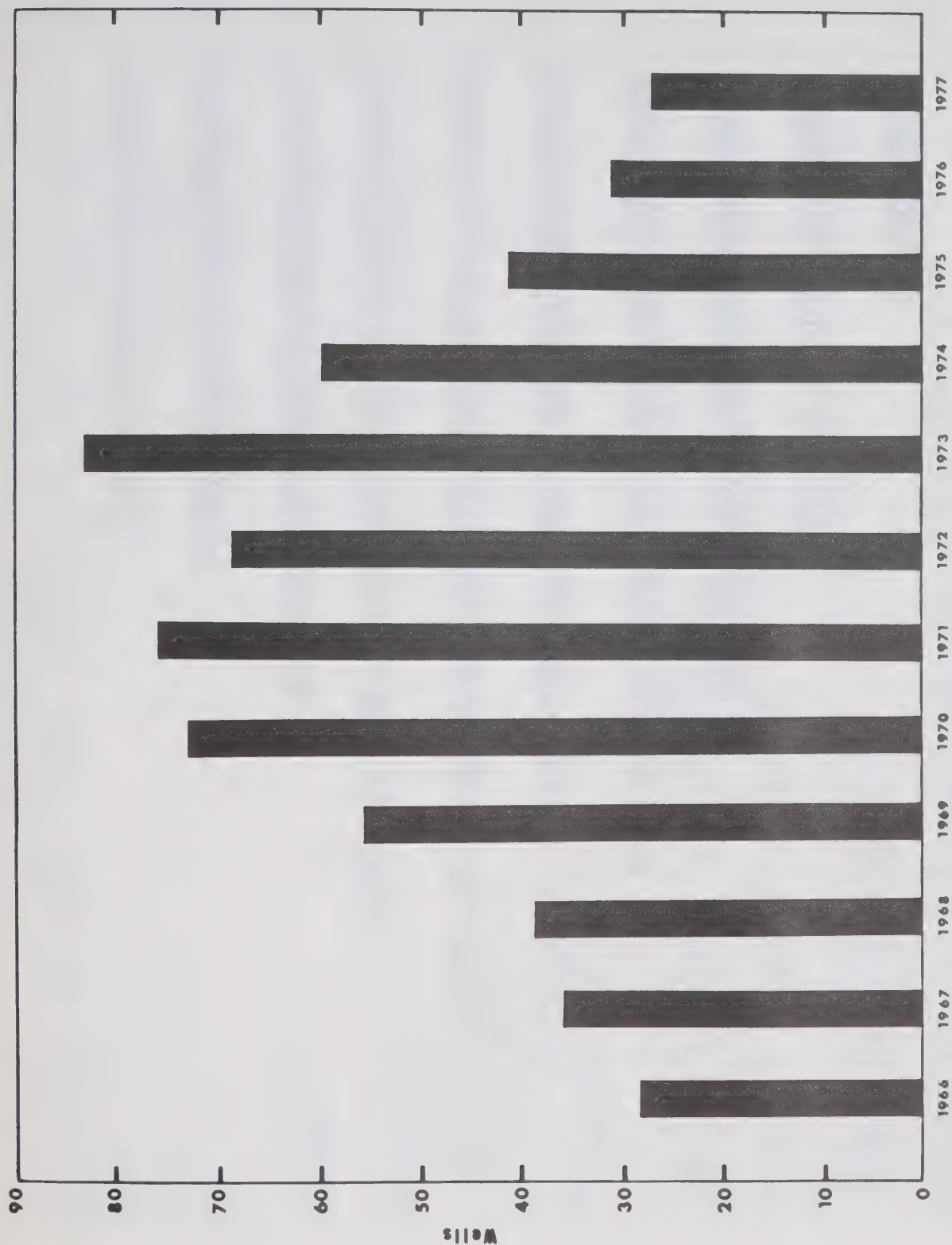


Fig. 16  
**Depth Drilled**  
 Yukon Territory and Northwest Territories

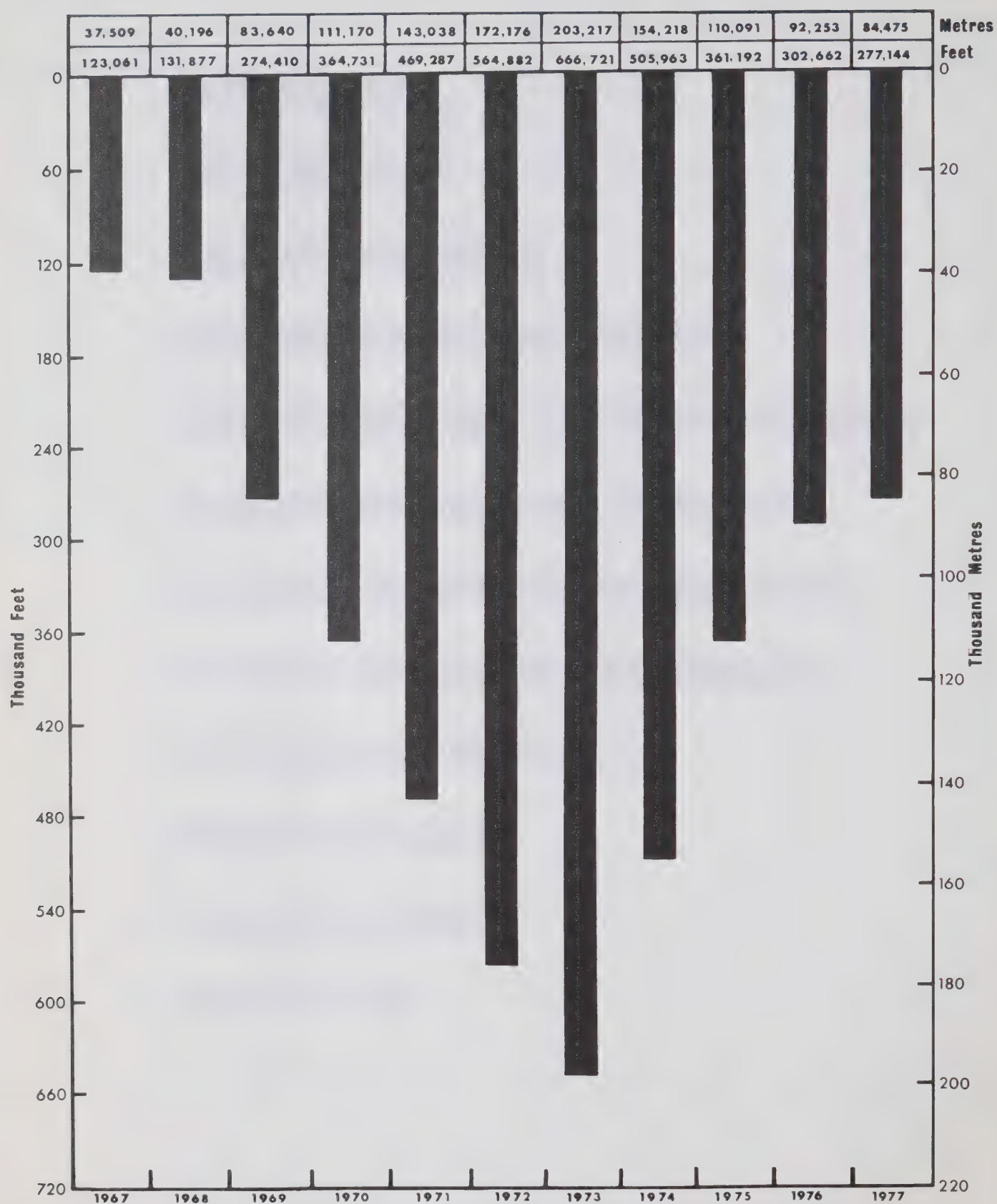
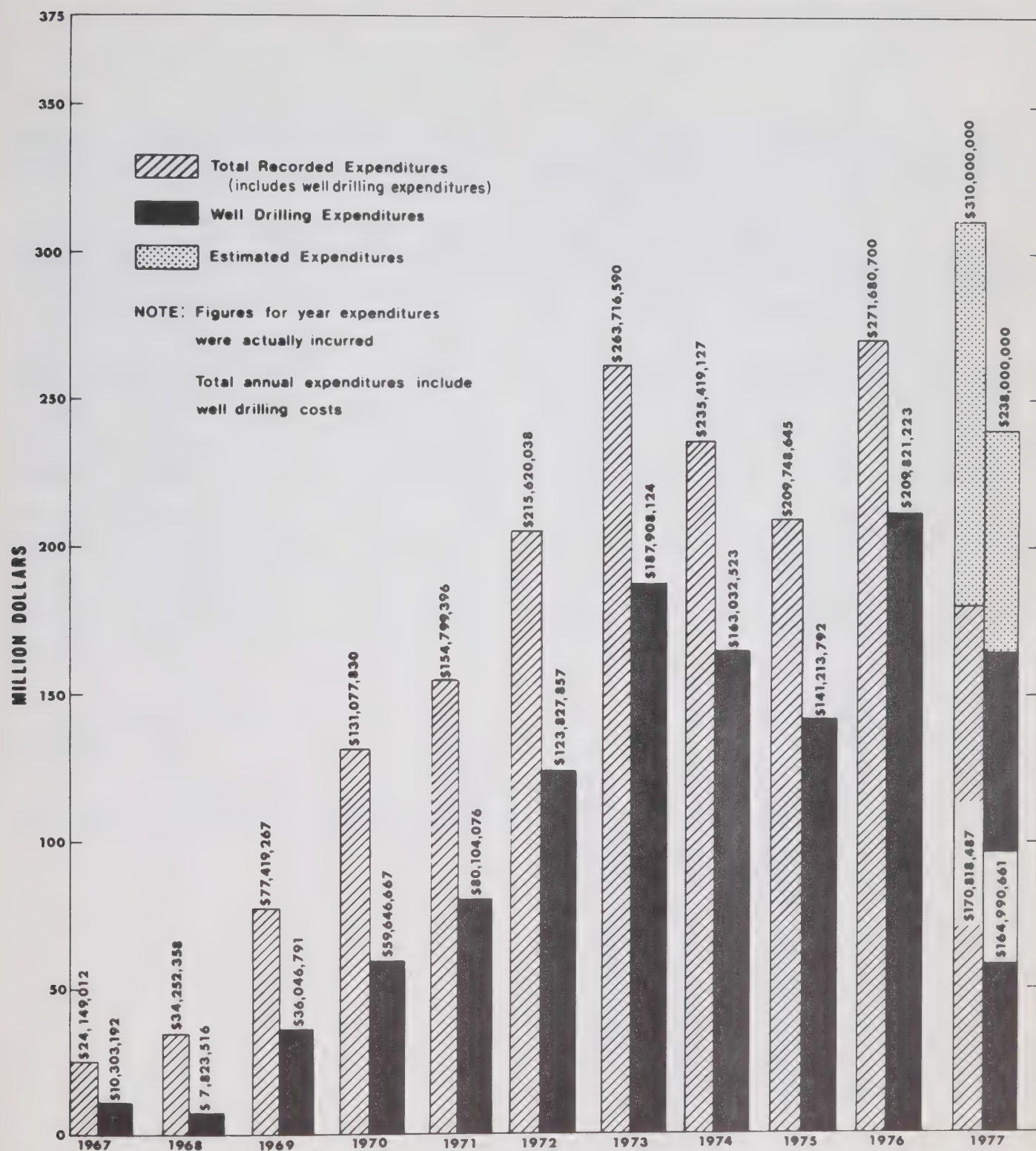




Fig. 17  
Oil & Gas Exploration Expenditures  
Submitted for Work Credits



# Net Cash Expenditures by Industry in 1977

**Table 9 — Net Cash Expenditures 1976 Final**  
(in thousands of dollars)

	<i>Off Shore</i>			Yukon N.W.T. and Arctic Islands	Canada
	East Coast	Hudson Bay	West Coast		
<b>Geological and Geophysical Expenditures</b>					
(a) Seismic Crew expenses .....	8 413	—	—	58 178	144 826
(b) All other geological and geophysical expenses .....	6 698	789	—	23 800	129 473
<b>Land and Lease acquisition and retention</b>					
(a) Permit fees and acquisition costs .....	231	2	—	27	229 243
(b) Non-producing acreage retention costs .....	1 082	7	—	2 968	77 819
(c) Producing lease and surface rentals .....	53	—	—	279	36 928
Exploratory drilling .....	48 182	—	—	200 500	558 017
Development drilling .....	—	—	—	11 408	333 200
<b>Other capital expenditures</b>					
(a) Tangible well and lease equipment .....	—	—	—	380	336 871
(b) Pipelines and related facilities .....	—	—	—	—	64 452
(c) Secondary recovery and pressure maintenance projects .....	—	—	—	—	22 050
(d) Natural gas processing plants .....	—	—	—	7 862	170 706
(e) All other capital expenditures .....	—	—	—	200	31 122
Field, well and pipeline operations .....	—	—	—	2 981	511 999
Natural gas plant operations .....	—	—	—	2 944	217 579
<b>Other operating expenditures</b>					
(a) Taxes (excluding income taxes) .....	22	—	—	45	120 191
(b) Royalties .....	—	—	—	4 843	2 202 800
(c) Interest expense .....	1 264	—	—	1 299	185 421
(d) Other .....	638	—	—	434	120 411
<b>Total .....</b>	<b>66 583</b>	<b>798</b>	<b>—</b>	<b>318 148</b>	<b>5 493 108</b>

Total expenditures, according to information compiled by INA, EMR, Statistics Canada and industry are shown in Tables 9 and 10 and Fig. 17. Gross industry expenditures North of 60 increased over those of 1976 by approximately \$50 million to reach a total of \$369 million. Exploratory and development drilling expenditures increased to \$277 million (up 38 per cent), while total geological and geophysical expenditures decreased to \$56 million, a five per cent decline from 1976. For the 1977 period, expenditures on lands administered by EMR were only \$45 million, a decrease of \$22 million from the previous year.

**Table 10 — Net Cash Expenditures 1977 Preliminary**  
(in thousands of dollars)

	<i>Off Shore</i>			Yukon N.W.T. and Arctic Islands	Canada
	East Coast	Hudson Bay	West Coast		
<b>Geological and Geophysical Expenditures</b>					
(a) Seismic Crew expenses .....	6 793	—	—	25 578	160 613
(b) All other geological and geophysical expenses .....	10 217	151	—	30 383	192 614
<b>Land and Lease acquisition and retention</b>					
(a) Permit fees and acquisition costs .....	20	—	—	28	735 890
(b) Non-producing acreage retention costs .....	1 611	—	—	3 527	83 985
(c) Producing lease and surface rentals .....	—	—	—	128	40 083
Exploratory drilling .....	23 834	—	—	277 944	784 094
Development drilling .....	—	—	—	7 147	438 881
<b>Other capital expenditures</b>					
(a) Tangible well and lease equipment .....	37	—	—	4 385	282 047
(b) Pipelines and related facilities .....	—	—	—	3 853	56 481
(c) Secondary recovery and pressure maintenance projects .....	—	—	—	—	31 876
(d) Natural gas processing plants .....	—	—	—	2 142	155 505
(e) All other capital expenditures .....	992	—	—	2 471	46 179
Field, well and pipeline operations .....	—	—	—	3 318	574 835
Natural gas plant operations .....	—	—	—	1 476	259 052
<b>Other operating expenditures</b>					
(a) Taxes (excluding income taxes) .....	40	—	—	321	111 857
(b) Royalties .....	—	—	—	4 842	2 673 821
(c) Interest expense .....	1 027	—	—	108	157 409
(d) Other .....	238	—	—	1 351	122 242
<b>Total .....</b>	<b>44 809</b>	<b>151</b>	<b>—</b>	<b>369 002</b>	<b>6 907 464</b>



# Production, Processing and Refining

## Gas

In The Northwest Territories, six gas wells in the Pointed Mountain Gas Field — G-62, K-45, O-46, P-53, F-38 and A-55, in grid area 60-30-123-45 — produced gas at a combined gross average rate of 60.6 MMCFD (million cubic feet per day) plus 547 BWPD (barrels of water per day) for a yearly total of 22.133 BCF (billion cubic feet) and 199 917 barrels of water.

The Beaver River Gas Field straddles the Yukon-British Columbia border with one well, Pan Am Beaver River Y.T. G-01, in grid area 60-10-124-15, in the Yukon portion of the field. A total of 0.315 BCF was produced from the Mississippian formation in this well during 1977, at an average gross rate of 1.1 MMCFD. Under a royalty-sharing unitized-pool agreement between the British Columbia and the Federal Governments, 7 per cent of the total Nahanni formation production, or 0.181 BCF, was assigned to the Yukon portion of the field for 1977.

Gas produced from the Pointed Mountain Field is transported via Westcoast Transmission to the Clarke Lake gas plant at Fort Nelson, B.C. Gas from the Beaver River Field, part of which underlies the Yukon, is also transported to the Clarke Lake plant.

## Oil

The Norman Wells Oil Field, lying in the west central part of the Northwest Territories, had 59 oil wells capable of production in 1977, with 26 producing regularly. Total gross field production during the year averaged 2 616 BOPD plus 4.7 MMCFD of gas, for a yearly total of 995 196 barrels of oil and 1 707 BCF of gas.

The only refinery in Canada located North of 60 is at Norman Wells and is operated by Imperial Oil Limited. It has a calendar day capacity of 3 200 barrels. In 1977, the refinery processed an average of 2 700 barrels per day of locally produced crude oil. A continuing modernization program is underway to upgrade the refinery facilities. Installation of additional tankage for storage of Bunker C fuels was completed in 1977 and a new refrigeration unit with a capacity of 500 MCFD to reduce the dew point of the gas to -40°F was added. This will result in increased reliability of gas supply.



Musk-ox on Arctic Tundra. (Courtesy Panarctic Oils Ltd.)

## The Foothills Project

The decision not to build the Mackenzie Valley Pipeline at present was made in 1977 and, in September, Canada and the United States signed an agreement to allow the construction of a natural gas pipeline for the transport of gas from Prudhoe Bay, Alaska, to the Lower 48 States. Fig. 18 shows roughly the proposed route. Under the agreement, a spur line from the Delta area (the Dempster lateral) could, if required or desired, be built in the 1980s. Foothills Pipe Lines Ltd. is the sponsor of the Canadian sections and Foothills (Yukon) Ltd. as the parent company, has completed its corporate restructuring by the incorporation of the following six federal subsidiaries;

- Foothills Pipe Lines (South Yukon) Ltd. — presently owned 100% by Foothills (Yukon), by whom the line will be constructed, operated and managed for the 512 miles that it runs parallel to existing highways through the Yukon. It is expected that investment participation in this subsidiary will be subscribed by Indian groups and other local Yukon residents in the future.
- Foothills Pipe Lines (North B.C.) Ltd. — to be owned 51% by Foothills (Yukon) and 49% by West-coast Transmission, will build the 440 miles of 56-inch mainline pipe across northeastern British Columbia along the Alaska Highway as far as the Alberta border.
- Foothills Pipe Lines (Alta.) Ltd. — to be owned 51% by Foothills (Yukon) and 49% by Alberta Gas Trunk Line Company Limited, will build the 806 miles of 56-inch, 42-inch and 36-inch mainlines in Alberta.
- Foothills Pipe Lines (South B.C.) Ltd. — to be owned 51% by Foothills (Yukon) and 49% by Alberta Natural Gas Company Ltd., will build the 105 miles of 36-inch mainline across southeastern British Columbia.
- Foothills Pipe Lines (Sask.) Ltd. — to be owned 51% by Foothills (Yukon) and 49% by Trans Canada Pipelines Ltd., will build 160 miles of 42-inch mainline across southwestern Saskatchewan.

- Foothills Pipe Lines (North Yukon) Ltd. — to be owned 51% by Foothills (Yukon) and up to 49% of Trans Canada Pipelines Ltd., is the project company and is prepared to apply for the Dempster lateral to the Delta as needed. It is committed, in any case, to file an application with the National Energy Board by July 1, 1979 for that installation.

- The parent company, Foothills (Yukon) Ltd., will be owned, for the time being, 40% each by the Alberta Gas Trunk Line Company Ltd. and Westcost Transmission Co. Ltd. and 20% by Trans Canada Pipelines Ltd. who, in August 1977 agreed in principle to participate in the project. The 40%-holdings will be reduced in due course by a general public offering in Canada.

Applications or supporting submissions by all participants were filed before the Federal Power Commission in the United States and National Energy Board in Canada in the summer and Fall of 1976.

The 731 miles of 48-inch mainline pipe in Alaska is the responsibility of Northwest Pipeline Corporation of Salt Lake City, Utah, and its future American partners in that section of the line.

Under legislation introduced into the House of Commons, a new Northern Pipeline Agency will be created to provide a single regulatory authority to undertake federal responsibilities for planning and monitoring construction of the pipeline system.

The initial capacity of the system is estimated as capable of carrying up to 2.4 billion cubic feet of United States gas daily and 1.2 billion cubic feet of Canadian gas.



Telesat receiving station at Norman Wells. (Courtesy Pacific Western Airlines)

Based on Foothills' objective of achieving some 90% input of Canadian goods and services in the project in this country — including the Dempster lateral — it is estimated that 100,000 man-years of employment would be created in Canada, directly as a result of the project and indirectly as a result of further economic activity generated by pipeline outlays. Excluding the Dempster lateral, the total man-years are estimated at approximately 68,000.

Based on the present schedule, construction would not commence until the winter of 1980-81 in Northern B.C. and the Yukon. Under the Canadian-USA Agreement, a start on pipe laying could not commence in the Yukon before January 1, 1981. Target date for commencement of system operations: January 1, 1983.





### Route and Mileages of the Northern Pipeline

From Prudhoe Bay, Alaska, flanking Alyeska line southward to Fairbanks and southeast along route of Alaska Highway to Alaska-Yukon border: 731 miles

From Alaska border to Whitehorse in the Yukon, (connecting point for proposed 737-mile lateral to Mackenzie Delta) entering Northeast B.C. near Watson Lake and continuing southeast to enter Alberta near Boundary Lake and onward to James River near Caroline. Here the line divides into a western leg to Kingsgate, B.C. and an eastern leg to Monchy, Saskatchewan. Total distance in Canada including Delta lateral: 2 765 miles

In the Lower 48 states, the *western leg* to California will be provided through looping of existing system operated by Pacific Gas Transmission Co. and Pacific Gas and Electric Co., and the *eastern leg* to mid-western states will be constructed by the Northern Border Co. Total mileage: 1 991 miles

Total mileage of system through Canada and USA, including Dempster lateral: 5 487 miles

At the 1977 value of the dollar, estimated costs of the Foothills facilities amount to:

• Alaska .....	\$ 3.5 billion
• Canada, excluding the Dempster lateral .....	\$ 4.7 billion
• Lower 48 States .....	\$ 2.3 billion
Total cost .....	\$10.5 billion

### The Polar Gas Project

The Polar Gas Group, managed by Trans Canada Pipelines Ltd., was formed early in 1972 to investigate the feasibility of a natural gas pipeline from the Arctic Islands to southern markets. During 1977, it continued research and investigation into the construction and operation of such a line. On December 21, 1977, it filed an application with the National Energy Board and DINA for the necessary approvals to construct a 2340-mile (3765-km) pipeline, including 89 miles (143 km) of marine crossings. Decision on this proposal is not expected until some time in 1978. The estimated cost of this project is \$ 6.1 billion in 1976 dollars. Decision on this proposal is not expected until some time in 1978.

The proposed route would run from the Drake Point and Hecla natural gas fields on Melville Island, across Byam Channel, Byam Martin Island and Austin Channel to Bathurst Island, across Bathurst Island, Little Cornwallis Island, Cornwallis Island and Barrow Strait to Somerset Island. It would then proceed south on Somerset Island to reach the most northerly point of the mainland — the tip of Boothia Peninsula on the south shore of Bellot Strait. It would then run south through the District of Keewatin, N.W.T. to enter Manitoba north and west of Churchill and would cross Manitoba, enter Ontario just east of Kistigan Lake and continue southeast to terminate at an interconnection with the Trans Canada Pipelines system near Longlac, Ontario.

The pipeline will have an outside diameter of 42 inches (1 067 millimetres) except in some channel and river crossings which will be crossed with parallel lines of pipe with an outside diameter of 36 inches (914 millimetres). The laterals to the gas processing plant in Melville Island will also have an outside diameter of 36 inches (914 millimetres).

The initial inlet capacity will be 1,350 million cubic feet per day, utilizing ten compressor stations. With an additional ten compressor stations, the capacity can be increased to 2 400 million cubic feet per day. The ultimate capacity, without looping, is 3 000 million cubic feet per day. This level of throughput would be achieved by the addition of yet another ten compressor stations, bringing the total number to thirty.

Proposed and existing northern pipeline routes are shown in Fig. 18.

# Participation and Research Projects

The number of participation and research projects was lower in 1977, with some 20 individual projects being undertaken. Expenditures incurred for these projects qualify for work credits and, when approved, can be applied to permits in designated approved areas. Major programs in these categories in 1977 included:

## Geophysical Surveys

Eureka Exploration Ltd. carried out two reconnaissance seismic programs this past year. The one, a 2 000-mile marine seismic project, was completed in the Baffin-Davis Strait area. The other, a 1 000-mile project in the Beaufort Sea, was only partially completed due to limited ship availability.

The Sun Oil Company, the operator for the Arctic Islands Offshore Group, completed the third and final year of its Sverdrup Basin seismic program for a total cost approximating \$40 million. In addition to the on-ice winter programs, some of the information was gathered by seismic ships during the open water season. The information costs were met by a consortium of major land holders in the Arctic Islands including Sun, Panarctic, Petro-Canada, Imperial Oil and others.

## Research Programs

*Arctic Petroleum Operators Association* (APOA) continued its heavy investment of effort and money in environmental and engineering research projects in the Far North. It initiated 10 new projects in 1977 as well as continuing several other studies. The new projects dealt mainly with ice mechanics and ice defense systems research. Imperial Oil, Aquitaine and other operators continued major environmental research projects in the Baffin Bay as a requirement for their application for Drilling Authorities.



Modern jet at Resolute airport. (Courtesy Pacific Western Airlines)



## EAMES

In November 1977, the Minister of Indian Affairs and Northern Development announced the setting up of a study program for the offshore areas of the Eastern Arctic. The object is to provide sufficient environmental impact data on which decisions for the granting or withholding of exploratory drilling permits at sites in the area can be made. The program is known as the Eastern Arctic Marine Environmental Studies or EAMES and covers the area indicated in Fig. 19. The waters off the east coast of Baffin Island are of principal interest in that they overlie formations considered potentially rich in oil.

Before drilling is permitted it is considered essential that the environmental conditions and constraints be determined in order to protect all segments of the ecology, and to ensure that adequate techniques, safeguards and remedies are known and available to cope with any possible disturbances or emergencies that drilling might create. This is the first time the initial approach to the exploration of a region has involved the studying of its total ecology as a complete whole rather than limiting research to the environment of a specific area.

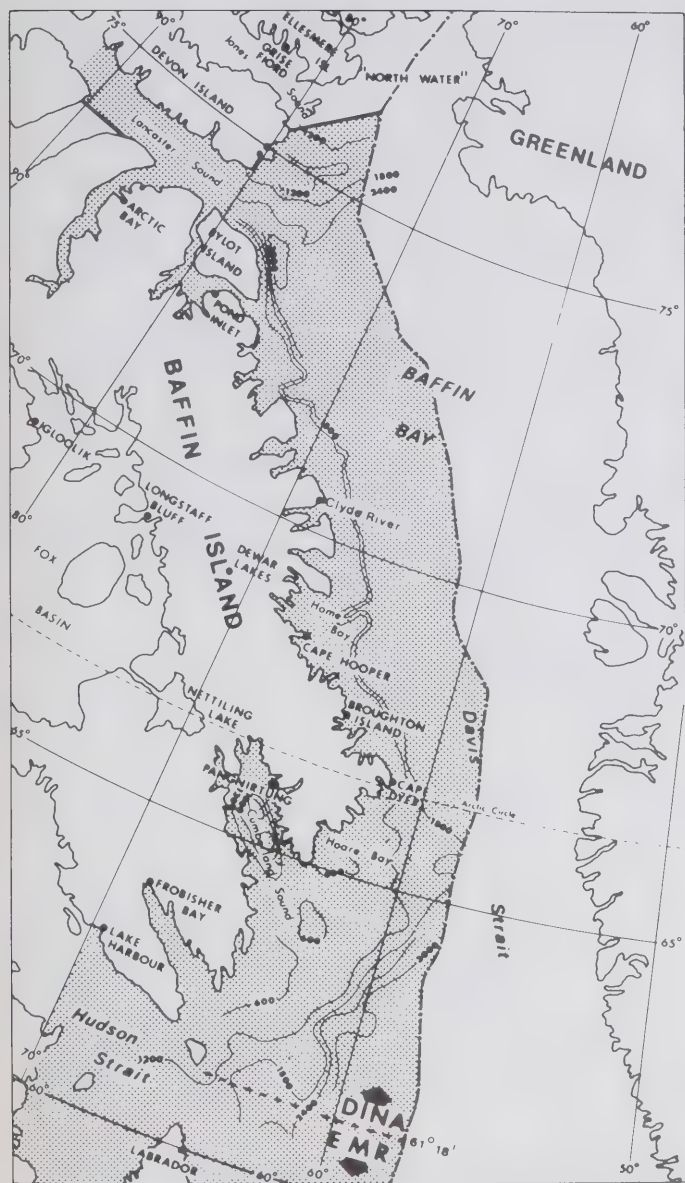
The most vital areas are Lancaster Sound, Baffin Bay and Davis Strait. The research is expected to take four years, but in view of the urgent need for oil, every effort is being made to reduce this time. Some studies by industry have already been completed.

The federal departments of EMR, DFE and DINA will all be involved, with the management committee under the Chairmanship of a DINA representative, but the work itself will be the responsibility of Industry. The federal departments will, of course, cooperate with any facilities or studies they alone can provide. As much use as possible will be made of the local Inuit knowledge and skills and the native people of the eastern Arctic will be included and actively involved in the planning and conduct of the studies. In addition to four specialists familiar with the coastal and offshore environment, and two representatives of the petroleum industry, the Advisory Board set up to assist the Management Committee will also include local and native representatives from ten communities in the area.

All environmental elements of the area are included in the program, land aspects as well as marine: wildlife, climate, fresh water and salt water areas, the shallow sea waters as well as the deep, ice conditions, waves and currents, the effects of possible oil spills and techniques to be developed to deal with them, and any other aspect that may, in the course of the study, be found to be relevant.

The program will be funded jointly by the federal government and industry, with industry bearing the heaviest share by far. Costs are anticipated to be well in excess of \$12 million.

Fig. 19  
**Eastern Arctic Marine Environmental  
 Study Area (EAMES)**



# Appendix I

## Source of Information Relative to Oil and Gas Activity North of 60°

### Publications

#### A. Maps

Many maps dealing with the northern resource activities are published by the Northern Non-Renewable Resources Branch and are available from the Oil and Gas Exploratory Operations Section, Calgary, Alberta, or from the Director, Northern Non-Renewable Resources Branch, Ottawa. The Branch publishes a list of maps which may be obtained from either of the above sources.

#### B. Reports

The following reports may be obtained from Supply and Services Canada, Printing and Publishing. Prepayment is required.

Schedule of Wells 1921-1971	—	\$10.00
Schedule of Wells 1972	—	\$5.00
Schedule of Wells 1973	—	\$5.00
Schedule of Wells 1974	—	\$5.00
Schedule of Wells 1975	—	\$5.00
Schedule of Wells 1976	—	\$5.00
Schedule of Wells 1977	—	in press
Oil and Gas Statistical Report No. 1 (1920-1960)	—	(out of print)
Oil and Gas Statistical Report No. 2 (1921-1972)	—	\$5.00

*Technical Reports available for Inspection 1977-78*  
(Geological and Geophysical Reports released from confidential status are available for public inspection only in the office of the Oil and Gas Exploratory Operations Section of this department in Calgary); — no charge (in press).

#### Other Sources of Information

Information on northern resources activities can be obtained from the Director, Northern Non-Renewable Resources Branch, Department of Indian and Northern Affairs, Ottawa, Ont. All cores and samples from wells drilled on Canada lands north of 60° N. latitude are stored at the Institute of Sedimentary and Petroleum Geology, 3303-33rd St. N.W., Calgary, Alberta. Samples and cores for wells which have been released from confidential status pursuant to the Canada Oil and Gas Land Regulations and the Canada Oil and Gas Drilling and Production Regulations may be inspected at the Institute. A list of such wells may be obtained from the Director, Northern Non-Renewable Resources Branch.

Specialized and technical literature pertaining to northern Canada may be obtained from the following government agencies:

#### Department of Indian and Northern Affairs

Departmental Library, 10 Wellington St., HULL, Quebec

(1) Oil and Gas Exploratory Operations Section, Department of Indian and Northern Affairs, Calgary.

#### Department of Energy, Mines and Resources

(1) Geological Survey of Canada — Ottawa, Ontario and Vancouver, B.C.

(2) Institute of Sedimentary and Petroleum Geology — Calgary, Alberta.

(3) Atlantic Geoscience Centre, Bedford Institute of Oceanography — Dartmouth, Nova Scotia.

(4) Pacific Geoscience Centre, Patricia Bay Institute of Ocean Sciences, Sidney, British Columbia.

(5) Earth Physics Branch — Ottawa, Ontario

#### Department of National Defence

Defence Research Board, Scientific Information Service — Ottawa, Ontario

#### Transport Canada

(1) Canadian Coast Guard — Ottawa, Ontario

Branches — Aids and Waterways

— Fleet Systems

— Ship Safety

— Coast Guard Emergencies

— Telecommunications and Electronics

Branch, Edmonton, Alberta and Ottawa, Ontario

(2) Civil Aviation Branch — Winnipeg, Manitoba

#### Arctic Institute of North America —

Calgary, Alberta

#### National Research Council —

Ottawa, Ontario

#### Public Libraries

The following brochures published by the Department of Indian and Northern Affairs may be available in some Public Libraries:

- i Guide to Northern Non-Renewable Resources
  - ii Communication and Transportation Facilities
- Queen Elizabeth Group — Arctic Islands



- iii Resource Management Division — Responsibilities and Administration
- iv Oil and Gas Canada Lands — Volume No. 2
- v Oil and Gas Canada Lands — Edition No. 3
- vi Oil and Gas in the Yukon and Northwest Territories — Edition No. 4 — 1967
- vii Oil and Gas — North of 60 — 1968
- viii Oil and Gas — North of 60 — 1969
- ix Oil and Gas — North of 60 — 1970
- x Oil and Gas — North of 60 — 1971
- xi Oil and Gas — North of 60 — 1972
- xii Oil and Gas — North of 60 — 1973
- xiii Oil and Gas — North of 60 — 1974
- xiv Oil and Gas — North of 60 — 1975
- xv Oil and Gas — North of 60 — 1976
- xvi Prospectus — North of 60

#### **Information and Procedures Concerning Operations on Canada Lands**

Certain federal agencies are concerned with exploration of Canada lands and must be notified prior to the commencement of any exploration activity. The operator or permittee, not the contractor, is responsible for providing the requisite advance notice of planned programs to these agencies by writing directly to them.

For offshore programs, the Director, Northwest Territories Region, Northern Affairs Program, Dept. of Indian and Northern Affairs at Yellowknife, Northwest Territories, in addition to the Northern Non-Renewable Resources Branch, must be informed with respect to each program. He will communicate with every department and agency on a need-to-know basis with respect to Marine Geophysical Programs. In the case of the Hudson Bay region, operators must also inform the National Research Council of Canada of proposed operations to be undertaken during the summer months.

Circumstances may be such that other agencies should be notified as well, and these are listed on the following pages, together with the names of persons who can be of assistance. For example, since operators are responsible for any damage they may cause to underwater commercial cables, it is recommended that they contact the Canadian Hydrographic Service for cable-lay data covering the area over which the work is to be performed. Similarly, the Department of National Revenue, Customs and Excise should be contacted by the importing company if vessels or equipment are to be brought in from abroad.

Information in the brochure *Communications and Transportation Facilities Queen Elizabeth Group, Arctic Islands*, is being updated and will be available in a comprehensive report entitled *Operational Guide for Oil and Gas Companies in the North*. This publication is now in preparation and should be available by December 1978. In addition to information concerning communication and transportation, the report will contain information covering all aspects of exploration in the North.

#### **Department of Indian and Northern Affairs**

Pursuant to Section 52 of the Canada Oil and Gas Land Regulations, *Notice of Commencement of Exploratory Work* must be filed 15 days prior to commencement of proposed exploratory programs (geophysical, geological and Research) on the mainland in the Northwest Territories and Yukon Territory and Arctic Islands, and 45 days prior to commencement of geophysical work on offshore areas, with the Oil and Gas Exploratory Operations Section, Northern Non-Renewable Resources Branch, Department of Indian and Northern Affairs, 112 — 11th Avenue, S.E., CALGARY, Alberta T2G 0X5.

Information and assistance may also be obtained from:

Director,  
Northern Non-Renewable Resources Branch,  
Department of Indian and Northern Affairs,  
OTTAWA, Ontario  
K1A 0H4  
Name: Dr. H.W. Woodward  
Phone: 819-997-9339

or from:  
Chief,  
Oil and Gas Lands Division,  
Name: P. Sullivan  
Phone: 819-997-9741

Advice on exploratory programs and operational matters may be obtained from:

Head,  
Oil and Gas Exploratory Operations Section,  
Name: S.A. Kanik  
Phone: 819-997-9444

Drilling authority and advice on drilling matters can be obtained from the District Conservation Engineer for the appropriate District. (See Fig. No. 20 for District boundaries).

*Oil and Gas Engineering Division*

Chief Petroleum Engineer — Appointment pending  
Head, Drilling and Completion  
Engineering Section — M.K. El-Defrawy  
Head, Reservoir  
Engineering Section — T.M. Baker  
Head, Pipelines  
Engineering Section — R.E. Jackson  
Scientific Research and Special  
Projects Co-ordinator — I.M. Feldman  
Regional Oil and Gas  
Conservation Engineer, — M.D. Thomas  
N.W.T. Yellowknife  
Regional Oil and Gas  
Conservation Engineer, — G.E. Blue  
Y.T. Whitehorse  
District Oil and Gas — B.N. Berry  
Conservation Engineers — for Arctic Islands  
in Yellowknife,  
District 1, N.W.T.  
— Appointment Pending  
for Southern Sector,  
(South of 67°)  
N.W.T. in Yellowknife,  
District 2, N.W.T.  
— D.R. Whitehead for the  
Northern Sector (North  
of 67° & Beaufort Sea)  
N.W.T. in Inuvik,  
District 3, N.W.T.

A Land Use Permit must be acquired for every land use operation, including drilling operations. A water licence or water authorization is required for all water use in accordance with the *Northern Inland Waters Act* and Regulations. Advance notice of 90 days is required before the start of drilling operations and all seismic activities, including marine seismic surveys involving the use of high explosives, in the event that qualified observers are needed. Notice of 45 days to the Regional Director is also required before the start of a seismic survey in which a source of acoustical energy other than high explosives is to be used.

Information and advice on the Land Use Regulations, Land Use Permits and water use authorizations can be obtained:

**For the Northwest Territories:**

Director, Northwest Territories Region,  
Northern Affairs Program,  
P.O. Box 1500,  
YELLOWKNIFE, N.W.T.  
X0E 1H0  
Name: R. Hornal  
Phone: 408-873-4421

**For the Yukon Territory:**

Director, Yukon Region,  
Northern Affairs Program,  
200 Range Road,  
WHITEHORSE, Y.T.  
Y1A 3V1  
Name: B.J. Trevor  
Phone: 403-668-5151

**Department of Energy, Mines and Resources  
Resource Management and Conservation Branch**

The Resource Management and Conservation Branch is responsible for the administration of federal interest in the mineral resources off Canada's east and west seacoasts and in the Hudson Bay and Hudson Strait regions.

As a general rule all correspondence should be addressed to:

Dr. D.G. Crosby,  
Director,  
Resource Management and Conservation Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario  
K1A 0E4

The Branch may be reached by:

Telephone: (613) 995-9351  
Telex: 053-4366  
Telecopier: 996-5707

*The Mineral Rights Division of the Branch*, through the issuance of exploration permits and production leases, makes available rights to mineral development on all Canada lands in the Offshore excluding the High Arctic; and ensures that holders of such terminable grants fulfill the terms and obligations stipulated in the Regulations in order to maintain their interests in good standing.

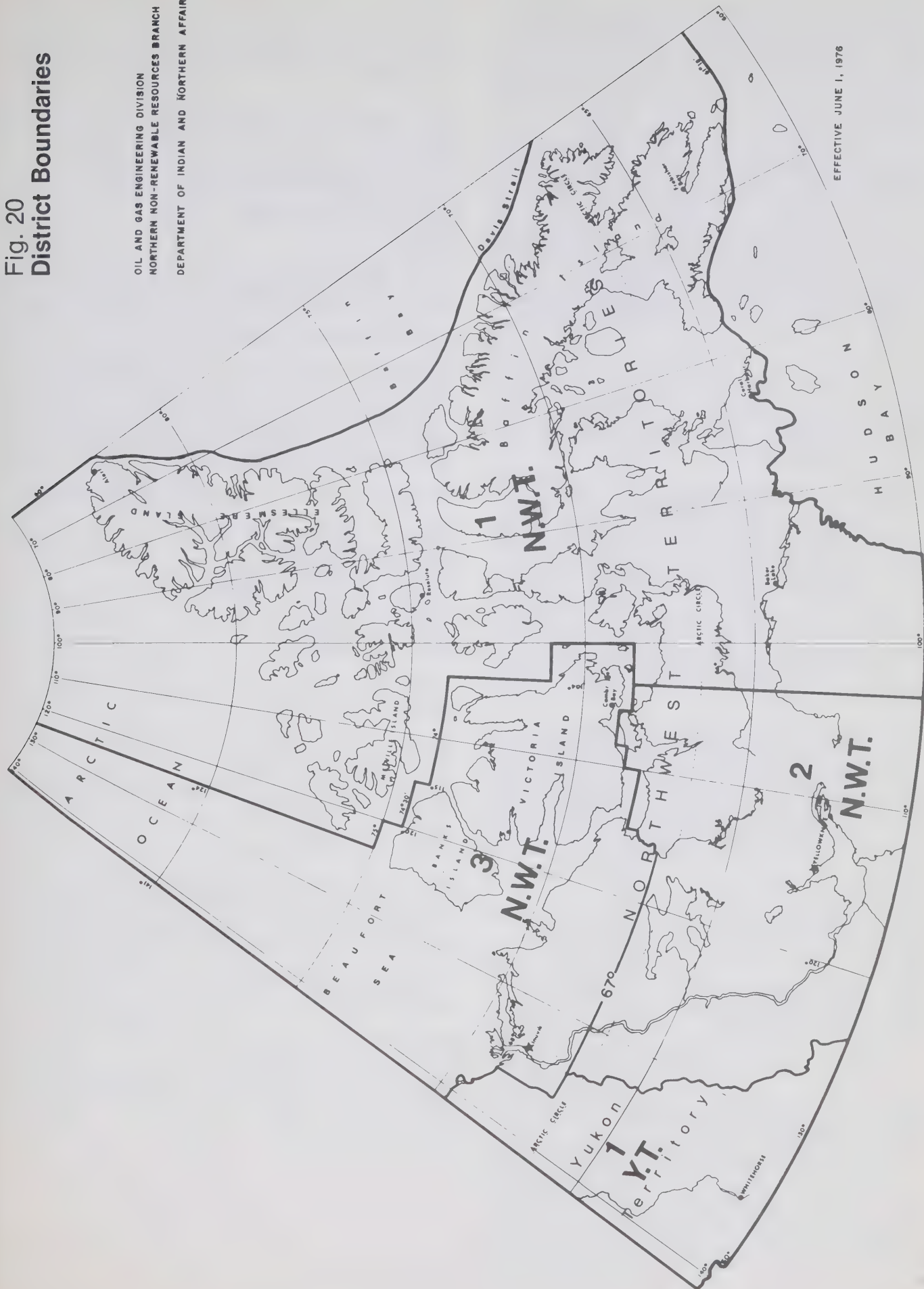
Advice and assistance on matters relating to the disposition and administration of mineral rights, such as the issuance and terms of permits and leases and expenditures allowable for credit against permit or lease work obligations, may be obtained from:

D.L. Tough,  
Chief,  
Mineral Rights Division,  
Resource Management and Conservation Branch,  
OTTAWA, Ontario K1A 0E4

Fig. 20

# District Boundaries

OIL AND GAS ENGINEERING DIVISION  
NORTHERN NON-RENEWABLE RESOURCES BRANCH  
DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS



EFFECTIVE JUNE 1, 1976



*The Resource Geology Division of the Branch* evaluates geological and geophysical information submitted by offshore operators, and assesses the mineral resource potential of prospects and specific areas in Canada's offshore regions, as well as for federally-owned mineral rights in the Provinces, for resource management purposes. The Division is also responsible for the handling and curation of lithologic and paleontologic material from offshore wells, and for the assembly and maintenance of a data bank of geological and geophysical information from the offshore.

Requirements and procedures with regard to the submission, confidentiality and subsequent examination of geophysical and geological data, including well materials, as well as sources of geological information and related matters, may be obtained from the office of:

D.F. Sherwin,  
Chief,  
Resource Geology Division,  
Resource Management and Conservation Branch,  
OTTAWA, Ontario K1A 0E4

*The Operations and Conservation Division of the Branch* exercises regulatory control over all activities associated with exploration, drilling, production conservation or conservation of offshore oil and gas. This control includes the analysis of operational hazards, of proposed equipment and installations in the Offshore and the nature and economic potential of reservoirs. Operators must meet the requirements of the Division as regards the safety of personnel, the protection of the environment, the prevention of pollution and waste, and the conservation of resources.

Assistance on such operational matters as the drilling, testing, completion or plugging of offshore wells; offshore structures; geophysical surveys; reporting requirements; pollution contingency plans; offshore environmental and feasibility projects; and the availability of reports after their release from confidential status may be obtained from the office of:

Director,  
Operations and Conservation Division,  
Resource Management and Conservation Branch,  
OTTAWA, Ontario  
K1A 0E4  
Name: G.R. Yungblut  
Phone: (613) 995-9351  
After Hours: (613) 722-9286

or from other engineers in the Division including:

F. H. Lepine,  
Head, Drilling and Operations Section  
Phone: (613) 995-9351

On the East Coast, information and assistance on operational matters and on the examination of well materials, in addition to exploration and assessment reports, is available from the Branch's Regional Office in Dartmouth:

East Coast Offshore Operations Manager,  
Resource Management and Conservation Branch,  
Department of Energy, Mines and Resources,  
Bedford Institute of Oceanography,  
P.O. Box 1006,  
DARTMOUTH, Nova Scotia  
B2Y 4A2  
Name: T.W. Dexter  
Phone: (902) 426-3179  
After Hours: (902) 477-5886

#### *Surveys and Mapping Branch*

Information on the systems, methods and equipment utilized for positioning and surveying with respect to exploration work may be subject to review by this agency. Moreover, legal surveys must be made in accordance with instructions of the Surveyor General.

Inquiries concerning surveying may be directed to:

Surveyor General and Director,  
Legal Surveys Division,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E9  
Name: D.R. Slessor  
Phone: (613) 994-9174

Information concerning control surveys may be obtained from:

Geodetic Survey Division,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E9  
Name: C.E. Hoganson  
Phone: 613-994-5079

When requesting control survey data, the inquiries should define the area involved by latitude and by longitude, and should indicate that the data is required for surveys relating to oil and gas exploration.

Air photographs covering all portions of Canada may be obtained from:

National Air Photo Library,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E9  
Attention: G. Nitschky  
Phone: 613-994-5457

and

Publications and Air Photo Section,  
Institute of Sedimentary and Petroleum Geology,  
3303 — 33rd Street, N.W.,  
CALGARY, Alberta T2L 2A7  
Attention: Mrs. D. Cormier  
Phone: 403-284-0110

Topographic maps, indices, charts, atlases and numerous other map publications may be obtained from:

Canada Map Office,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E9  
Attention: P.K. Andrews  
Phone: 613-998-3865

and

Publications and Air Photo Section,  
Institute of Sedimentary and Petroleum Geology,  
3303 — 33rd Street, N.W.,  
CALGARY, Alberta  
T2L 2A7  
Attention: Mrs. D. Cormier  
Phone: 403-284-0110

D.I.A.N.D.,  
Mining Recorder,  
Map Office,  
Box 1500,  
YELLOWKNIFE, N.W.T.  
X1A 2R3

Regional Geologist,  
D.I.A.N.D.,  
N.N.R. and E.B.,  
200 Range Road,  
WHITEHORSE, Y.T.  
Y1A 3V1

Geological Survey of Canada,  
Information Service and Sales,  
Dept. of E.M.R.,  
100 West Pender St., 6th Floor,  
VANCOUVER, B.C.  
V6B 1R8

Maritime Resource Management Services,  
Information Centre,  
Box 310,  
16 Station St.,  
AMHERST, N.S.  
B4H 3Z5

Ministere de l'Energie  
des Mines et des Ressources,  
Bureau Regional de Vente de Cartes,  
1535 Chemin Ste-Foy,  
QUEBEC, P.Q.  
G1S 2P1

### ***Geological Survey of Canada***

The Geological Survey of Canada carries out systematic geological and geophysical surveys in the sedimentary basins of Canada, including parts of the regions offshore from the east and west coasts, in Hudson Bay, and in the Arctic Islands.

Inquiries with regard to the operations and publications of the Geological Survey should be made to:

Director-General,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E8  
Name: D.J. McLaren  
Phone: 613-994-5817

or to:

Director,  
Institute of Sedimentary and Petroleum Geology,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
CALGARY, Alberta  
T2L 2A7  
Name: D.F. Stott  
Phone: 403-284-0110

or to:

Director,  
Atlantic Geoscience Centre,  
Department of Energy, Mines and Resources,  
P.O. Box 1006,  
DARTMOUTH, Nova Scotia  
B2Y 4A2  
Name: B.D. Loncarevic  
Phone: 902-426-2367

or to:

Head, Marine Geology Section,  
Pacific Geoscience Centre,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
Box 6000,  
SIDNEY, British Columbia  
V8L 4B2  
Name: D.L. Tiffin  
Phone: 569-656-8269

### ***Polar Continental Shelf Project***

The Polar Continental Shelf Project is a continuing investigation of the continental shelf fringing the Arctic coast of Canada, together with adjacent parts of the Arctic Ocean basin, the islands of the Canadian Arctic Archipelago and the intervening waters, and other areas of special interest.



Inquiries regarding surveys and scientific studies in Arctic areas may be directed to:

Director,  
Polar Continental Shelf Project,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario  
K1A 0E4  
Name: G. Hobson  
Phone: 613-996-3388

***Earth Physics Branch***

The Earth Physics Branch operates a network of Arctic geophysical observatories and carries out systematic geophysical surveys and studies throughout Canada including the Arctic.

Inquiries with regard to the scientific studies, surveys and publications of the Earth Physics Branch should be directed to:

Director-General,  
Earth Physics Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario  
K1A 0Y3  
Name: K. Whitham  
Phone: 613-994-5253

**Department of Fisheries and the Environment**

***Environmental Protection Service***

This agency is advised on a need-to-know basis by the Regional Director of Resources, Department of Indian and Northern Affairs, of any drilling operations and all seismic activities, including marine seismic surveys involving the use of high explosives in the event that qualified observers are needed. Information regarding the Department's requirement can be obtained from:

Assistant Deputy Minister,  
Environmental Production  
Service,  
Department of Fisheries and  
the Environment,  
15th Floor, Place Vincent Massey,  
OTTAWA, Ontario K1A 0H3  
Name: Mr. L. Edgeworth  
Phone: 819-997-1575 or 997-1576

***Fisheries and Marine Service***

***Fisheries Management***

Information on the following fisheries matters may be obtained from:

Yukon freshwater and marine fish:

Director-General,  
Fisheries Management,  
Fisheries and Marine Service,  
Department of Fisheries and the Environment,  
1090 West Pender Street,  
VANCOUVER, B.C.  
V6E 2P1  
Name: Dr. G. Geen  
Phone: 604-666-6097

Northwest Territories freshwater fish, including Arctic char:

Director-General,  
Fisheries Management,  
Fisheries and Marine Service,  
Department of Fisheries and the Environment,  
Freshwater Institute,  
501 University Crescent,  
WINNIPEG, Manitoba  
R3T 2N6  
Name: Dr. G.H. Lawler  
Phone: 204-269-7379

Northwest Territories including Hudson Bay, marine fish and marine mammals:

Director,  
Arctic Biological Station,  
Fisheries and Marine Service,  
Department of Fisheries and the Environment,  
STE. ANNE DE BELLEVUE, Québec  
H9X 3L6  
Name: Dr. A. Mansfield  
Phone: 514-457-3660

General information on environment assessment studies and research relating to contaminants in freshwater and marine water of the Arctic:

Director,  
Aquatic Environment Branch,  
Fisheries and Marine Service,  
Department of Fisheries and the Environment,  
580 Booth Street,  
OTTAWA, Ontario  
K1A 0H3  
Name: Dr. J.C. MacLeod  
Phone: 613-995-2205



### *Ocean and Aquatic Sciences*

The Canadian Hydrographic Service publishes charts of Canadian navigable waters.

General Information concerning charts may be obtained from:

Canadian Hydrographic Service,  
Department of Fisheries and the Environment,  
615 Booth Street,  
OTTAWA, Ontario  
K1A 0H3

Name: Mr. L.P. Murdoch

Phone: 613-994-5377

Information concerning charts showing Canada's Territorial Sea and Fishing Zone Limits and related data may be obtained from:

Canadian Hydrographic Service,  
Department of Fisheries and the Environment,  
K1A 0H3

Name: Mr. E.J. Cooper

Phone: 613-994-9330

Commercial Cable-lay data may be obtained from:

Canadian Hydrographic Service,  
Department of Fisheries and the Environment,  
615 Booth Street,  
OTTAWA, Ontario  
K1A 0H3

Name: Mr. J. Bruce

Phone: 613-994-5141

Information on tides may be obtained from:

Tides, Currents and Water Levels,  
Canadian Hydrographic Service,  
Department of Fisheries and the Environment,  
615 Booth Street,  
OTTAWA, Ontario  
K1A 0H3

Name: Dr. W.F. Forrester

Phone: 613-994-9146

Information on hydrographic surveys and control data in the Eastern Arctic may be obtained from:

Regional Hydrographer,  
Canadian Hydrographic Service,  
Atlantic Oceanography  
Laboratory,  
Department of Fisheries  
and the Environment,  
Bedford Institute of Oceanography,  
DARTMOUTH, Nova Scotia  
B2Y 4A2

Name: Mr. R.C. Melanson

Phone: 902-426-3497

Information on hydrographic surveys and control data in the western Arctic may be obtained from:

Regional Hydrographer,  
Canadian Hydrographic Service,  
Ocean and Aquatic Sciences,  
Department of Fisheries  
and the Environment,  
512 Federal Building,  
VICTORIA, B.C.  
V8W 1Y4

Name: Mr. M. Bolton

Phone: 604-388-3188

Physical and Chemical Oceanography. Information on the following matters may be obtained from:

*Western Arctic* (Beaufort Sea and Sverdrup Basin):

Director-General,  
Ocean and Aquatic Sciences,  
Fisheries and Marine Service,  
Department of Fisheries  
and the Environment,  
512 Federal Building,  
VICTORIA, B.C.  
V8W 1Y4

Name: Dr. R.W. Stewart

Phone: 604-566-3383

*Eastern Arctic* (Baffin Bay and Davis Strait):

Director-General,  
Ocean and Aquatic Sciences,  
Fisheries and Marine Service,  
Department of Fisheries  
and the Environment,  
Bedford Institute of Oceanography,  
DARTMOUTH, Nova Scotia  
B2Y 4A2

Name: Dr. W.L. Ford

Phone: 902-426-3492

*Central Arctic* (including Hudson Bay and James Bay):

Director-General,  
Fisheries and Marine Service,  
Canada Centre for Inland Waters,  
Department of Fisheries and the Environment,  
P.O. Box 5050,  
BURLINGTON, Ontario  
L7R 4A6

Name: Mr. M.G. Johnson

Phone: 416-637-4673

Data on physical-chemical oceanography, tidal predictions, wave climate, etc.:

Director,  
Marine Environmental Data Service,  
Ocean and Aquatic Sciences,  
Fisheries and Marine Service,  
Department of Fisheries and the Environment,  
580 Booth Street,  
OTTAWA, Ontario  
K1A 0H3

Name: Dr. J.R. Wilson

Phone: 613-995-2007

*General Information* on oceanographic activities in the Arctic:

Director-General,  
Marine Sciences and Information Directorate,  
Ocean and Aquatic Sciences,  
Fisheries and Marine Service,  
Department of Fisheries and the Environment,  
580 Booth Street,  
OTTAWA, Ontario  
K1A 0H3  
Name: Dr. N.J. Campbell  
Phone: 613-995-2039

***Environmental Management Service***

Information concerning wildlife such as the locations of migratory bird sanctuaries and National Wildlife Areas, and the Arctic Ecology Maps Series that show important and critical wildlife areas of the Canadian Arctic where human activities can have adverse or destructive impact on wildlife population may be obtained from:

Director-General,  
Canadian Wildlife Service,  
Department of Fisheries and the Environment,  
16th Floor, Place Vincent Massey,  
OTTAWA, Ontario  
K1A 0H3  
Name: Mr. N.G. Perret  
Phone: 819-997-1360

Information concerning research into oil spills in icy waters; stream flow; water levels and quality; permafrost hydrology, flood forecasting; river basin planning; sediment surveys; ice studies; and water demand, supply, use, diversion and conservation; and environmental impact assessment, may be obtained from:

Inland Waters Directorate,  
Environmental Management Service,  
Department of Fisheries and the Environment,  
6th Floor, Place Vincent Massey,  
OTTAWA, Ontario K1A 0H3  
Phone: 819-997-3119

Information concerning northern forests and vegetation; their mapping; growth; relationship to terrain, soils and landscapes; and stability, may be obtained from:

Director-General,  
Canadian Forestry Service,  
Department of Fisheries and the Environment,  
19th Floor, Place Vincent Massey,  
OTTAWA, Ontario  
K1A 0H3  
Name: Dr. R.J. Bouchier  
Phone: 819-997-1454

or

Director,  
Forest Management Institute,  
Canadian Forestry Service,  
Department of Fisheries and the Environment,  
396 Cooper Street,  
OTTAWA, Ontario  
K1A 0H3  
Name: Dr. L. Sayn-Wittgenstein  
Phone: 613-996-1674

or

Director,  
Northern Forest Research  
Centre,  
Canadian Forestry Service,  
Department of Fisheries and the Environment,  
5320 — 122 Street,  
EDMONTON, Alberta  
T6H 3S5  
Name: Dr. G.T. Silver  
Phone: 403-435-7210

or

Director,  
Pacific Forest Research  
Centre,  
Canadian Forestry Service,  
Department of Fisheries and the Environment,  
506 West Burnside Road,  
VICTORIA, B.C.  
V8Z 1M5  
Name: Mr. H. Drinkwater  
Phone: 604-388-3811

The map series, entitled Land Use Information Series (for northern Canada), provides extensive data on renewable resources and related human activities. Coverage now includes all of the Yukon Territory, the Mackenzie Valley and the Great Slave Lake region. Enquiries for obtaining this map series may be directed to:

Canada Map Office,  
Department of Energy, Mines and Resources,  
130 Bentley Avenue,  
OTTAWA, Ontario  
K1A 0E9  
Phone: 613-994-9663

Further information on the series may be obtained from:

Lands Directorate,  
Department of Fisheries and the Environment,  
20th Floor, Place Vincent Massey,  
OTTAWA, Ontario  
K1A 0H3  
Name: Mr. K. Taylor  
Phone: 819-997-2240

### ***Atmospheric Environment Service***

Requests for information and assistance on meteorological and sea-ice data, climatology, weather forecasting, meteorological instruments and research may be directed to:

Assistant Deputy Minister,  
Atmospheric Environment Service,  
Department of Fisheries and the Environment,  
4905 Dufferin Street,  
DOWNSVIEW, Ontario  
M3H 5T4  
Name: Dr. A.E. Collin  
Phone: 416-667-4760

Information may also be obtained through the Meteorological Liaison Officer in Ottawa. This position is filled on a rotation basis and the name of the officer is subject to change.

Inquiries in Ottawa may be directed to:

Liaison Meteorologist,  
Department of Fisheries and the Environment,  
13th Floor, Fontaine Building,  
OTTAWA, Ontario  
K1A 0H3  
Name: D.J. Wright  
Phone: 819-997-1588

### ***Environmental Assessment Panel***

Under the federal Environmental Assessment and Review Process, projects with potentially significant environmental effects are referred to the Panel by other federal departments and agencies for review. Projects concerned are those initiated by federal departments and agencies or involving federal funds and property. Further information may be obtained from:

Chairman,  
Environment Assessment  
Panel,  
Department of Fisheries and the Environment,  
13th Floor,  
Fontaine Building,  
OTTAWA, Ontario  
K1A 0H3  
Name: Mr. F.G. Hurtubise  
Phone: 819-997-3426

### **Department of National Defence *Maritime Command***

The appropriate office of Maritime Command will be advised on the need-to-know basis by the Regional Director of Resources of any exploration program proposed for the offshore.

Operations in Baffin Bay and Arctic waters east of longitude 105° West are handled by the office of:

Commander Maritime Command,  
Department of National Defence,  
F.M.O. HMC Dockyard,  
HALIFAX, Nova Scotia

Operations in Arctic waters west of longitude 105° W are handled by the office of:

Commander Maritime Forces Pacific,  
Department of National Defence,  
F.M.O. HMC Dockyard,  
VICTORIA, B.C.

Operations on-shore North of 60 are handled by the office of:

Commander Northern Region,  
P.O. Box 6666,  
YELLOWKNIFE, N.W.T.  
X1A 2R3

### ***Search and Rescue***

The Department of National Defence is responsible for the co-ordination of search and rescue (SAR) operations in Canada.

The overall Canadian area of responsibility is divided into four SAR areas as listed below:

#### ***Edmonton SAR***

This area includes the three Prairie provinces, all of the Northwest Territories Mainland and Arctic Islands, the western half of Hudson Bay, and Baffin Island north of 70° N.  
The contact is:

Edmonton Search and Rescue Region  
Phone: 403-973-8402

#### ***Victoria SAR***

This area includes British Columbia, Canadian waters off the west coast, the Yukon Territory and the Beaufort Sea south of 70° N and west of 135° W.  
The contact is:

Victoria Search and Rescue Region  
Phone: 604-388-1543

#### ***Halifax SAR***

This area includes Quebec east of 70° W, the Maritime Provinces, Labrador, Canadian waters off the East Coast, Foxe Basin, Hudson Strait and Baffin Island south of 70° N.  
The contact is:

Halifax Search and Rescue Region  
Phone: 902-426-4730  
902-426-4735



### **Trenton SAR**

This area includes all Ontario, Quebec west of 70° W, eastern Hudson Bay and James Bay.

The contact is:

Trenton Search and Rescue Region  
Phone: 613-392-2811 Locals 3870, 3875

Any of the following may also be contacted in case of emergencies: Air Traffic Control Centres, airport control towers, radio stations, marine radio stations, RCMP detachments, provincial and municipal police stations.

The following information is required when making an *Alert Report*:

- a. Name of caller, phone number, and official connection, e.g. RCMP detachment commander, aircraft owner, etc.;
- b. Assistance required;
- c. Description of aircraft, boat, or whatever craft is involved;
- d. Full details as to the nature of distress or emergency.

### **Department of Transport**

#### ***Aid and Waterways Branch — Marine Aids Division***

At least 60 days notice is required by this Division before the commencement of any offshore exploration program in order that appropriate local Notices to Shipping and national Notices to Mariners may be issued. These Notices are subsequently copied into related foreign publications.

The Division also indicates the requirement of any aids to navigation devices that may be necessary for the program.

Advance notice of 90 days is required in any case where drilling involves the territorial sea, in order for approval to be granted under the Navigable Waters Protection Act.

All communications on these matters should be directed to:

Director,  
Aids and Waterways Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario  
K1A 0N7  
Phone: 613-992-2736  
Name: J.N. Ballinger

In addition, there are a number of Departmental officers who may be contacted in the field should the need arise.

### **Fleet Systems Branch**

This Branch has major responsibilities in two areas of concern in offshore operations: support of shipping in ice-congested waters, and marine search and rescue.

If operations are being contemplated for areas where ice may be a problem and where ice-breakers or other support may be desired, there should be consultation with the Director, Fleet.

Further information and assistance may be obtained from:

Director,  
Fleet Systems Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario  
K1A 0N7  
Name: R.G.A. Lawrence  
Phone: 613-992-4209

### ***Search and Rescue (Marine)***

The Canadian Coast Guard of the Department of Transport has the responsibility for the provision of marine search and rescue vessels, and also marine SAR experts to work with Defence personnel in the co-ordination of rescue operations, which is conducted from regional Rescue Co-ordination Centres. The Coast Guard is also responsible for marine accident prevention and safety through both regulation and education programs, and for organizing and managing the Coast Guard Auxilliary of marine rescue volunteers across Canada. The Commissioner of the Canadian Coast Guard is Co-Chairman of the Inter-departmental Committee of Search and Rescue, (ICSAR) which maintains an active management overview of Government SAR operations.

Director, Fleet Systems  
as above

(or)

Chief, Search and Rescue,  
Canadian Coast Guard.  
Name: A.F. Mountain  
Phone: 613-995-5861

Their titles and addresses are given below:

- (i) District Manager,  
Canadian Coast Guard,  
Transport Canada,  
101 Boulevard Champlain,  
QUEBEC, Quebec  
G1K 4H9

Phone: 418-694-3420  
(This office handles aids to navigation in Hudson Bay and Strait area)

(ii) District Manager,  
Canadian Coast Guard,  
Transport Canada,  
P.O. Box 5002,  
HAY RIVER, N.W.T.  
0XE 0R0  
Phone: 403-874-2406

### ***Ship Safety Branch***

This Branch includes the Steamship Inspection Division, the Registry of Shipping, and the Nautical Division. The responsibilities of the Steamship Inspection Division include inspection and certification of ships under the Canada Shipping Act and the Arctic Waters Pollution Prevention Act. This Division also deals with ship safety and pollution matters arising from ship operations, and the application of the Arctic Shipping Pollution Prevention Regulations.

The Nautical Division deals with marine personnel, operational and navigation safety matters. At least 60 days notice is required by this Division when drilling operations are planned for areas lying in or near charted ship routes so any necessary authority may be issued.

Further information and assistance may be obtained from:

Director,  
Ship Safety Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario  
K1A 0N7  
Name: D.C. Findlay  
Phone: 613-992-8892

### ***Canadian Coast Guard Emergencies***

This office is responsible for the marine contingency planning function of the Department of Transport and also supplies co-ordination and assistance when a federal response is made to combat a spill of oil or toxic materials into the marine environment. The response is made under the National Marine Emergency Plan or in the case of international boundary waters, the appropriate Joint International Plan.

Further information and assistance may be obtained from:

Coast Guard Emergencies,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario  
K1A 0N7  
Name: Capt. M.S. Greenham  
Phone: 613-992-9743 or 992-9210

### ***Coast Guard Casualty Investigations***

This office is responsible for marine accidents investigations, enquiries, and wreck.

Further information and assistance may be obtained from:

Chief,  
Coast Guard Casualty Investigations,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario  
K1A 0N7  
Name: Capt. W.A.W. Catinus  
Phone: 613-992-4930 or 996-3808

### ***Department of Communications***

The responsibilities of this agency include the development of technical standards, the selection and co-ordination of radio frequencies, and the licensing of all classes of radio station except broadcasting.

An operator contemplating the use of radio-communications in his off-shore activities should make application for licensing of any radio station in Canada or on board any Canadian vessel involved at least six weeks before the proposed in-service date of the communication facility. Details as to the licensing requirements and the necessary application forms may be obtained from the following addresses:  
In Ottawa:

Director,  
Operations Branch,  
Telecommunication Regulatory Service,  
Department of Communications,  
300 Slater Street,  
OTTAWA, Ontario  
K1A 0C8  
Phone: 613-992-9642

Companies in Western Canada may contact:

Regional Director,  
Pacific Region,  
Department of Communications,  
325 Granville Street, Room 300,  
VANCOUVER, B.C.  
V6C 1S5  
Phone: 604-666-6580

Regional Director,  
Central Region,  
Department of Communications,  
2300 — One Lombard Place,  
WINNIPEG, Manitoba  
R3B 2Z8  
Phone: 204-985-4081

District Manager,  
Department of Communications,  
205 — 8th Avenue, S.E., Room 803, 805,  
CALGARY, Alberta  
T2G 0K9  
Phone: 403-231-4201

District Manager,  
Department of Communications,  
400 Baker Center,  
10025 — 106th Street,  
EDMONTON, Alberta  
T5J 1G6  
Phone: 403-425-5189

District Manager,  
Department of Communications,  
Federal Building,  
GRANDE PRAIRIE, Alberta  
T8V 0X9  
Phone: 403-532-3533

Companies in Northern Canada may contact:

District Manager,  
Department of Communications,  
P.O. Box 540,  
FORT SMITH, N.W.T.  
X0E 0P0  
Phone: 403-872-2187

District Manager,  
Department of Communications,  
Polaris Building  
201 — 4133, 4th Avenue,  
WHITEHORSE, Y.T.  
Y1A 1H8  
Phone: 403-667-5102

District Manager,  
Department of Communications,  
P.O. Box 2700,  
YELLOWKNIFE, N.W.T.  
X1A 2R1  
Phone: 403-873-3568

Companies in Central Canada (Ontario/Quebec) may contact:

Regional Director,  
Ontario Region,  
Department of Communications,  
9th Floor,  
55 St. Clair Avenue East,  
TORONTO, Ontario  
M4T 1M2  
Phone: 416-996-6280

Regional Director,  
Quebec Region,  
Department of Communications,  
20th Floor,  
2085 Union Street,  
MONTREAL, Quebec  
H3A 2C3  
Phone: 514-283-7994

Companies in Eastern Canada may contact:

Regional Director,  
Department of Communications,  
7th Floor,  
Terminal Plaza Building,  
1222 Main Street,  
MONCTON, N.B.  
E1C 8P9  
Phone: 506-858-2396

### **National Research Council of Canada**

#### ***Space Research Facilities Branch***

Operators planning offshore activities in the Hudson Bay region must inform the following agency of the National Research Council well in advance since rockets are fired on a year round basis from the Churchill Research Range:

Head,  
Operations,  
Space Research Facilities Branch,  
National Research Council of Canada,  
OTTAWA, Ontario  
K1A 0R6  
Name: J.A. Tarzwell  
Phone: 613-993-9385

Operators active in the Hudson Bay region are also required to co-ordinate their field activities with:

Officer-in-Charge,  
Churchill Research Range,  
National Research Council of Canada,  
CHURCHILL, Manitoba  
ROB 0E0  
Name: D. Gray  
Phone: 204-856-2250

Rockets are also launched from time to time from the facilities at Resolute Bay, N.W.T. and Cape Perry, N.W.T. Operators with exploration work planned for this vicinity are urged to co-ordinate their activities with the National Research Council, Ottawa.



**Department of National Revenue**  
***Customs and Excise***

The Headquarters Operations Directorate administers that portion of the Canada Shipping Act that relates to the coastal trade. In this connection, any company importing ships or specialized plants and equipment for exploration work on Canada's sea-coasts and among the Arctic Islands may obtain information, assistance and such other contacts as may be necessary in Customs and Excises from:

Director General,  
International Traffic Programs  
Division,  
Revenue Canada,  
Customs & Excise,  
OTTAWA, Ontario  
K1A 0L5  
Name: E.D. Warren  
Phone: 613-992-0693

**Canada Employment and Immigration Commission**

***Canada Immigration Division***

Director,  
Policy Liaison,  
Program Development Division,  
Recruitment and Selection Branch,  
Canada Immigration Division,  
Canada Employment & Immigration Commission,  
OTTAWA, Ontario  
Name: K.F. Jensen  
Phone: 613-992-5654

The Winnipeg and Edmonton offices of the Canada Employment and Immigration Commission can answer any queries regarding entry into the Northwest Territories. The Vancouver office can respond to queries for entry into the Yukon Territory.

At Tuktoyaktuk, a local R.C.M.P. officer is also a representative for Employment and Immigration and can clear entry into Canada via Tuktoyaktuk.

At Inuvik, the Customs Officer is also Commission representative for Employment and Immigration and can be contacted by telephone if prior arrangements are necessary. There is no representative in Aklavik; in the event that a seismic crew prefers to land at Aklavik, arrangements must be made with the Inuvik representative.

# Appendix II

## To all Permittees and Lessees

### ***Expenditures Relating to Processing and Interpretation of Geophysical Data Acquired on Canada Lands***

"An information letter was distributed to all Permittees and Lessees advising operators that as from January 1, 1974, expenditures incurred in computer processing and the interpretation of Geophysical Data acquired in the course of exploration activities involving Canada Lands will not be considered eligible for approval as allowable expenditures unless such processing and interpretation has been carried out in Canada.

After January 1, 1974, an operator submitting a claim, pursuant to the *Canada Oil and Gas Land Regulations*, for allowable expenditures involving geophysical operations undertaken on Canada Lands must identify on his statement of expenditure the name of the company or companies involved together with the location of: (a) the computer facilities utilized in the processing of the geophysical data; and (b) the offices wherein interpretation of the geophysical data was undertaken. Expenditures incurred for computer processing must be separately identified and not included as part of the costs incurred for interpretation.

Further in this regard, the processing of geophysical data undertaken on board non-Canadian seismic ships will be considered to be work undertaken outside Canada and not eligible for approval as allowable expenditures.

Director,  
Northern Non-Renewable  
Resources Branch,  
Department of Indian  
Affairs and Northern  
Development."

### ***Transfer of Interest — Canada Lands***

"The *Canada Oil and Gas Land Regulations* stipulate that no transfer of an oil and gas permit or lease shall pass any interest in a permit or lease until the transfer is registered in accordance with the Regulations, which registration must be approved by the Chief. Please be advised that one of the considerations for the approval of the registration of a transfer of any interest in a permit or lease will be that all agreements or an executive summary relating to such transfer of interest have been deposited with the Chief.

All permittees are requested, therefore, to arrange to forward a copy of each current agreement, or an executive summary, to the federal agency concerned at their earliest convenience. In future such agreements should be deposited with the Chief of the appropriate federal agency at the time they are made.

The confidentiality of documents relating to these agreements will of course be maintained until permission to release them is given by the Companies involved.

Director,  
Northern Non-Renewable  
Resources Branch"

### ***Importation and Operation of Foreign Vessels***

"The importation and operation of vessels coastwise or between Canadian and foreign ports are subject to the Customs Act, the Canada Shipping Act, and Coastwise and Foreign Shipping Regulations and the Customs Tariff. These acts and regulations, *Inter Alia*, are administered by the Customs Programs Branch of the Department of National Revenue.

A company wishing to import ships or specialized plant and equipment for exploration work off Canada's seacoasts is requested to make application well in advance of the proposed commencement date of any programme. In order to ensure that the application is processed properly, this department should be advised at least ninety days before the commencement of the programme. This lead time of ninety days is needed to determine the suitability of Canadian-flag vessels declared available to fulfill the purposes respecting which temporary entry is sought.

Each application must state the area of operation and the approximate time span, and contain a description of the salient features of the energy source equipment proposed for the particular operation. Information should also be supplied in respect of all other essential criteria required, including bunker and stores capacity, accommodation, clear deck space, size of instrumentation room, electrical energy additional to vessel's normal operation needs and possible draft restrictions.

Any additional information, assistance and other contacts as may be necessary in Customs and Excise may be obtained from:

Director,  
Transportation Programs Directorate,  
Department of National Revenue,  
Customs and Excise,  
OTTAWA, Ontario  
K1A 0L5  
Tel. (613) 992-1900"



# Appendix III

## Reporting Forms

The Northern Non-Renewable Resources Branch is a member of the "Federal Provincial Committee on Energy Statistics" and the "Mines Ministers Subcommittee on Oil and Gas Statistics" and together with the four western provinces and Statistics Canada has standardized all its oil and gas reporting forms. This standardization has removed duplication between government agencies and more important, industry can now process all oil and gas reporting forms from the western provinces and the Yukon and Northwest Territories on electronic data processing equipment without change of programs.

<b>Form No.</b>	<b>Title of Form</b>
IAN*52-90-1**	Application for a Drilling Authority
IAN*52-90-2	Well Completion Data
IAN*52-90-3**	Application to Amend a Drilling Authority
IAN*52-90-4**	Application to Change a Well Name
IAN*52-90-5**	Application to Abandon a Well or Suspend Drilling
IAN*52-90-6**	Application to Alter Condition of a Well
IAN*52-90-7	Work-over Report No.
IAN*52-90-8	Application to Commingle Production before Measurement Data for Back Pressure Test on Natural Gas Wells-Monograph 7 Method
IAN*52-90-9	
IAN*52-90-10	Data for Back Pressure Test on Natural Gas Wells-Vitter's Method
IAN*52-90-11	M.P.R. — Oil Calculations
IAN*52-90-12	New Oil Well Report
IAN*52-90-13	New Gas Well Report
IAN*52-90-17	New Service Well Report
IAN*52-90-18	Monthly Water Flood Operations Report
IAN*52-90-20	Monthly Water Receipts and Disposal of Fluids Report
IAN*52-90-23	Geologic Surface Survey & Airphoto Analysis — Expenditures
IAN*52-90-24	Land Geophysical Operations — Expenditures
IAN*52-90-25	Marine Geophysical Programs — Expenditures
IAN*52-90-26	Drilling & Structure Test Drilling Expenditures
IAN*52-90-27	Participation Programs — Expenditures

IAN*52-91**	Notice of Commencement of Exploratory Work
IAN*52-91-1**	Notice of Commencement of Research and Development Work
IAN*52-92	Application for Authority to Drill Structure Test Hole
IAN*52-93	Report on Abandonment of Structure Test Hole
IAN*52-83	Grouping Notice
IAN*52-103*	Application for Oil and Gas Lease
IAN*51-183	Monthly Accident Summary

\* To be completed by Operator

\*\* To be completed in triplicate; all other forms to be completed in duplicate.

All forms, except IAN 52-83, IAN 52-90-23 to IAN 52-90-27, IAN 52-91, IAN 52-91-1, and 52-103, are submitted to the appropriate District Oil and Gas Conservation Engineer.

Forms IAN 52-83, 52-90-23 to 52-90-27 and 52-103 are submitted to the Northern Non-Renewable Resources Branch, Ottawa, Ontario K1A 0H4.

Forms IAN 52-91 and 52-91-1 should be submitted to the Oil and Gas Exploratory Operations Section — 112-11th Avenue S.E., Calgary, Alberta T2G 0X5.

The following forms have been issued pursuant to the Canada Oil and Gas Land Regulations and Canada Oil and Gas Drilling and Production Regulations. These forms are to be completed when applicable during the production stage of oil and gas wells, and refinery operations.

<b>Form No.</b>	<b>Title of Form</b>
IAN 52-116-1	Monthly Production Report
IAN 52-116-2	Monthly Disposition and Crown Royalty Statement
IAN 52-116-3	Monthly Gas Gathering Statement
DBS 6511-38*	Monthly Oil Pipeline Gathering Operations Statement
IAN 52-116-5	Monthly Crude Oil and Condensate Purchaser's Statement
IAN 52-116-6	Monthly Gas Plant Statement
DBS 6511-37*	Monthly Natural Gas Distributors Statement
IAN 52-116-8	Monthly Gas Processing Plant Products Statement
IAN 52-116-9	Monthly Liquefied Petroleum Gas Purchaser's Statement
IAN 52-116-10	Monthly Refinery Operations Report
IAN 52-116-11	Monthly Gas Injection Operations Report
IAN 52-116-12	Statement of Nomination and Estimated Requirement of Crude Oil, Condensate and Pentanes Plus
IAN 52-116-13	Monthly Sulphur Plant Operations Report

**Notes:**

- (a) All forms to be completed by Operator.
- (b) Forms 6511-37 and 6511-38 are completed by the Operator in triplicate.

The first two copies are to be forwarded to the Northern Non-Renewable Resources Branch in Ottawa, and the third to the District Oil and Gas Conservation Engineer responsible for the District in which the well is located (see Fig. 20).

The other forms listed above are completed in duplicate. The original is submitted to the Northern Non-Renewable Resources Branch in Ottawa and one copy to the appropriate District Oil and Gas Conservation Engineer.

All the above forms will be converted to SI units and will be distributed to industry in 1978. The use of SI units will become mandatory as of January 1, 1979.

# Appendix IV

## Summaries of the Geological Provinces

### **1 Arctic Stable Platform**

The Arctic Stable Platform lies between the Precambrian Shield to the South and the Franklinian geosyncline to the north and west. The area is underlain by thin, gently dipping, relatively undisturbed Lower Paleozoic carbonates that overlie the craton and thicken northward from the Shield. The Platform is divided into several individual basins, Foxe Basin being the one farthest to the east.

### **2 Franklinian Geosyncline (Arctic Fold Belt)**

The limits of Paleozoic deformation define the division between the Franklinian Geosyncline and the Arctic Stable Platform to the south and east. The area was the site of continuous sedimentation from Cambrian to Upper Devonian time. Two depositional belts are recognized; a miogeosynclinal belt extending from Banks Island to northern Greenland, and a eugeosynclinal belt exposed only on Axel Heiberg and Ellesmere Islands. Thick carbonates and clastics constitute potential reservoirs. Strata were folded in the Ellesmerian orogeny of Late Devonian or Early Carboniferous time and these folded strata also constitute the "basement" underlying the Sverdrup Basin.

### **3 Sverdrup Basin**

A major angular unconformity marks the base of the Sverdrup Basin, a successor basin with a stratigraphic sequence of Lower Pennsylvanian to Tertiary strata overlying the folded Paleozoic rocks of the Franklinian Geosyncline. The structural and depositional axis of the Sverdrup Basin strikes northeast from Banks Island to northern Ellesmere Island. The thickness of sediments in the basin is in excess of 7 600 metres along this axis. The sediments, which are interrupted by a number of unconformities, thin from the axis to form an elongate basin. Sediment thickness and facies indicate that the present south and east limits of the basin are close to the original depositional limits. Tertiary strata of the Arctic Coastal Plain overlap the northern and western margins. Evaporites of late Paleozoic age form piercement structures in the axial zone. Upper Cretaceous and older sediments are intruded by igneous sills and dykes of varying thickness, mostly in the eastern half of the basin. The Eureka Orogeny, in late Cretaceous and early Tertiary time, produced folding and faulting throughout the basin; deformation was accompanied by emplacement or reactivation of piercement bodies. Intensity of deformation increases towards the northeast margin of the basin. Thick, sandy sequences of Jurassic and Triassic age contain the major hydrocarbon reserves.

### **4 Arctic Coastal Plain**

The north and west margins of the Sverdrup Basin, both on land and offshore, are covered by thick, relatively undisturbed Tertiary and Pleistocene clastics. Beds dip gently toward, and thicken on, the continental shelf and slope. In this area the continental shelf is approximately 160 kilometres wide. The shelf offshore from the Mackenzie Delta is termed the Beaufort Sea. The continental slope is defined as between 600 and 3 000 metres water depth. The deep Arctic Ocean, termed the Canada Basin, forms an abyssal plain seaward of the slope. The Tertiary and Mesozoic are considered to have the best offshore potential for oil and gas. Permanent ice cover and a short drilling season have hindered or made costly drilling in the offshore regions.

### **5 Baffin Bay/Davis Strait Basin**

The Baffin Bay/Davis Strait Basin lies entirely offshore and has been explored to date only by regional geophysical surveys. Several theories to explain the origin of the basin have been advanced: a widely accepted one involves continental drift by which Greenland and the Baffin land mass spread apart about a pivot point located somewhere to the northwest. Geophysical surveys have demonstrated that the basin is underlain by an oceanic crust, that there is no mid-basin ridge, and that as much as 7 600 metres of sediment cover the floor. Sediments thin to zero in nearshore areas and over the Davis Strait Sill. Rocks cropping out around the basin margins are predominantly Precambrian. Major centres of deposition are the Thule Basin off Greenland, the Lancaster Delta, the Home Bay Delta and the Cumberland Delta. Lancaster Sound and Jones Sound are structurally controlled grabens in which thick deltaic clastics accumulated. A major Tertiary drainage system transported sediment to the basin from a sediment source area to the west. The large volume of geologically young sediments and the presence of favourable trapping conditions for hydrocarbons give the Baffin Bay/Davis Strait area a high hydrocarbon potential.



## 6 Banks Basin

The Banks Basin occupies the central and west-central part of Banks Island and the adjacent coastal plains. Tertiary and Cretaceous clastics overlie mainly Lower and Middle Devonian sediments over much of the area. Proterozoic rocks of the Minto Arch occur at the southernmost tip. The sediments of the Banks Basin have been sparsely drilled and the presence of thick Tertiary and Mesozoic sediments and the reefal facies of the Devonian-Silurian carbonates give the area a moderate potential for hydrocarbon accumulations.

## 7 Mackenzie-Beaufort Basin

The Mackenzie Delta/Beaufort Sea petroleum province is made up of a thick section containing productive Cretaceous and Tertiary sands. The *Mackenzie Delta*, the southern portion of the Mackenzie-Beaufort Basin, is bounded by the Romanzof uplift to the southwest, the Richardson Mountains to the south, the Eskimo Lakes Arch to the southeast and the Arctic Ocean to the north. The Beaufort Sea is one of several marginal embayments that occur as indentations in the coastline of the Arctic Ocean. The Coastal Plain, which lies adjacent to the Beaufort Sea, is laterally continuous with the continental shelf and is considered as the onshore, exposed extensions of the Beaufort Sea shelf. The *Beaufort Sea petroleum province* is contiguous with the Yukon and Mackenzie Coastal Plains, and the Banks Coastal Plain.

Growth faults extend seaward from the Mackenzie Delta across the coastal plain. Shale diapirs form large, mostly offshore structures. Potential reservoir rocks, which include deltaic and marine sandstone are interbedded and continuous with organic-rich shales.

## 8 Interior Plains

a) *Great Slave Plain* — The Great Slave Plain encompasses an area extending westward from Great Slave Lake to the Liard Plateau and Mackenzie Mountains. Underlying strata are mainly of Devonian age, covered in part by remnants of a thick Cretaceous sequence. The total thickness of sediment ranges from zero in the east to more than 3 000 metres in the west. Gas reservoirs are found in porous dolomites and limestones of Middle Devonian age.

b) *Great Bear Plain* — The Great Bear Plain consists of Lower and Upper Cretaceous sediments partially on a bedrock of Ordovician to Devonian age. The total thickness of the sediments wedges from zero in the east to more than 1 800 metres in the west along the eastern edge of the Franklin Mountains.

c) *Anderson Plain* — The Anderson Plain lies east of the Mackenzie Delta. Cretaceous beds cover much of the Plain and lie unconformably on Lower and Middle Paleozoic beds. Sediments more than 2 400 metres thick occur in a southwest-northeast trend through the wells C.P.O.G. Kugaluk N-02 and Elf Horton River G-02. Hydrocarbon shows have been encountered in the Cretaceous deposits.

d) *Mackenzie Plain* — The Mackenzie Plain lies between the Franklin and Mackenzie Mountains. Cretaceous beds lie unconformably on Lower and Middle Paleozoic beds. Sediments range in thickness from 1 200 metres to 2 700 metres. Oil is produced in the Mackenzie Plain at Norman Wells, from the Devonian Kee Scarp formation. Additional hydrocarbon shows have been encountered in the Cretaceous and Silurian.

e) *Peel Plain* — The Peel Plain lies northeast of the Peel Plateau and northwest of the Mackenzie Plain. It is covered by Cretaceous and Jurassic sediments which overlie Paleozoic carbonates and shales. The sediments are similar to those of the Mackenzie Plain and range in thickness from more than 4 200 metres in the southwest to 2 400 metres in the northeast. Hydrocarbon shows have been encountered in the Lower Devonian.

## 9 Liard Plateau and Range

The Liard Plateau and Range lie west of the southern portion of the Great Slave Plain and northwest of the Fort Nelson Lowland. A thin Cretaceous cover lies unconformably on Paleozoic beds. The Beaver River and Pointed Mountain fields produce or have produced gas from thrust dolomites of the Nahanni formation of Middle Devonian Age. Current production in the Beaver River field in the Yukon is from large faulted anticlines containing Mississippian sands.

#### **10 Eagle Plain**

The Eagle Plain basin is contained between the Ogilvie and Richardson Mountains. Sediments approach 6 100 metres in thickness, of which about 3 000 metres are late Paleozoic to Mesozoic in age, the remainder being Cenozoic. The basin has been tectonically deformed. Hydrocarbon shows have been encountered in Mississippian, Devonian and Ordovician beds.

#### **11 Peel Plateau**

The Peel Plateau is bounded on the northwest and the east by the Peel Plateau Plain, on the south by the Mackenzie Mountains, and on the west by the Richardson Mountains. The Plateau is covered by Tertiary and Cretaceous clastics unconformably overlying Paleozoic shales and carbonates. The sediments range in thickness from 3 000 metres in the east to 6 100 metres in the west. Shows of hydrocarbons have been encountered in Cretaceous and Middle Devonian strata.

#### **12 Old Crow Basin**

The Old Crow Basin is a relatively unexplored intermontaine basin covering an area of about 6 200 square kilometres centred at about latitude 68°N and longitude 140°W. Geophysical data indicate a thickness of from 500 to 1 500 metres of Mesozoic and Tertiary clastics overlying as much as 3 000 metres of Upper Devonian to Permo-Carboniferous sediments. The Old Crow Basin as it now exists was formed by the Laramide orogeny in Tertiary time.

#### **13 Whitehorse Basin**

The Whitehorse Basin lies at the northern end of the Central Cordilleran Geosyncline. It is about 240 kilometres long and 110 kilometres wide and contains up to 4 600 metres of sediments ranging in age from early Cretaceous to Late Triassic.

A selected bibliography to the geology of the Yukon and Northwest Territories is provided in Appendix V.

# Appendix V

## Selected Bibliography

A wide variety of reports and papers applicable to geological provinces or basins in northern Canada are available, a majority are Geological Survey of Canada (GSC) publications or in proceedings and memoirs of various Societies. A listing of all GSC reports may be found in *Index to Publications 1959 — 1974* by P.J. Griffen, published by the GSC in 1976. The following is a list of the more important of these papers.

1 Aitken J.D., and Glass D.J. (Editors)  
1973: GAC — CSPG proceedings of the Symposium on the Geology of the Canadian Arctic.

2 Yorath C.J., Parker E.R. and Glass D.J. (Editors)  
1975: Canada's Continental Margins and Offshore Petroleum Exploration; C.S.P.G. Memoir 4, Canadian Society of Petroleum Geologists.

3 McCrossan R.G. (Editor)  
1973: Future Petroleum Provinces of Canada; C.S.P.G. Memoir 1, Canadian Society of Petroleum Geologists.

4 Wren A.E. and Cruz R.B. (Editors)  
1974: Proceedings of the 1973 National Convention; Canadian Society of Exploration Geophysicists.

For a complete list of oil industry technical reports released from confidential status, the reader should refer to the Departmental publication *Technical Reports Available for Inspection — 1976*.

Important references not found in the preceding publications are listed below.

### **Northwest Territories — Mainland**

1 Bily C. and Dick J.W.C.  
1974: Naturally occurring gas hydrates in the MacKenzie Delta, NWT; Bulletin of Can. Pet. Geol., Vol. 22, No. 3, pp. 340-353.

2 Cote R.P., Rector R., Lerand M.  
1974: Gulf describes Geology of the Parsons Lake Gas find, Can. Pet. — April, pp. 72-78.

3 Crickmay C.H.  
1970: Ramparts, Beavertail and other Devonian Formations; Bull. Can. Pet. Geol., Vol. 19, No. 1, pp. 67-79.

4 Law J.  
1971: Regional Devonian Geology and Oil and Gas Possibilities, Upper MacKenzie River Area; Bull. Can. Pet. Geol., Vol. 19, No. 2, pp. 437-484.

5 Meijer-Drees N.C.  
1975: Geology of the Lower Paleozoic Formations in the Subsurface of the Fort Simpson Area, District of Mackenzie, G.S.C. paper 74-40.

6 Smith M.W.  
1976: Permafrost in the MacKenzie Delta; G.S.C. paper 75-28.

7 Vopni L.K., and Lerbekmo J.F.  
1972: The Horn Plateau Formation: A Middle Devonian Coral Reef Northwest Territories; Bull. Can. Pet. Geol., Vol. 20, No. 3, pp. 498-548.

8 Young F.G.  
1975: Upper Cretaceous Stratigraphy, Yukon Coastal Plain and Northwestern MacKenzie Delta; G.S.C. Bull. 249.

### **Eagle Plain and Northern Yukon**

1 Bamber E.W. and Waterhouse J.B.  
1971: Carboniferous and Permian Stratigraphy and Paleontology, Northern Yukon Territory; Bull. Can. Pet. Geol., Vol. 19, No. 1, pp. 29-249.

2 Lenz A.C.  
1972: Ordovician to Devonian History of Northern Yukon and adjacent District of MacKenzie; Bull. Can. Pet. Geol., Vol. 20, No. 2, pp. 321-361.

3 Miall A.D.  
1973: Regional Geology of Northern Yukon; Bull. Can. Pet. Geol., Vol. 21, No. 1, pp. 81-116.

4 Norris A.W.  
1967: Devonian of Northern Yukon Territory and adjacent District of MacKenzie, Inter. Sym. on Dev. System, A.S.P.G.



#### **Arctic Islands**

- 1 Frebold H.  
1975: Jurassic Faunas of the Canadian Arctic; G.S.C., Bull. 243.
- 2 Klovan J.E. and Embry A.F. III  
1971: Upper Devonian Stratigraphy, Northeastern Banks Island; Bull. Can. Pet. Geol., Vol. 19, No. 4, pp. 705-729.
- 3 Plauchut B.P.  
1971: Geology of the Sverdrup Basin; Bull. Can. Pet. Geol., Vol. 19, No. 3, pp. 659-679.
- 4 Plauchut B.P. and Jutard G.G.  
1976: Cretaceous and Tertiary Stratigraphy, Banks and Eglington Islands and Anderson Plains; Bull. Can. Pet. Geol., Vol. 24, No. 3, pp. 321-371.
- 5 Snowdon L.R. and Roy K.J.  
1975: Regional Organic Metamorphism in the Mesozoic Strata of the Sverdrup Basin; Bull. Can. Pet. Geol., Vol. 23, No. 1, pp. 131-172.
- 6 Stuart-Smith J.H. and Wennekers J.H.N.  
1977: Geology and Hydrocarbon Discoveries of Canadian Arctic Islands; AAPG Bull., Vol. 61, No. 1, pp. 1-28.

#### **Arctic Coastal Plain and Continental Shelf**

- 1 Sobczak L.W.  
1975: Gravity and Deep Structure of the Continental Margin of Banks Island and MacKenzie Delta; Can. Jour. Earth Sc. Vol. 12, pp. 278-395.

#### **Hudson's Bay Basin and Lowlands**

- 1 Sanford B.V. and Norris A.W.  
1975: Devonian Stratigraphy of the Hudson Platform: Part I, Stratigraphy and Economic Geology. G.S.C. Memoir 379.

#### **Foxe Basin and Baffin Bay**

- 1 Keen C.E. et. al.  
1972: Geophysical Studies in Baffin Bay and some Tectonic Implications; Can. J. Earth Sc. Vol. 9, No. 3.
- 2 Keen C.E. and Barrett D.L.  
1973: Structural Characteristics of Some Sedimentary Basins in Northern Baffin Bay; Can. J. Earth Sc. Vol. 10, No. 7, pp. 1267-1278.
- 3 Trettin H.P.  
1975: Investigations of Lower Paleozoic Geology, Foxe Basin, Northeastern Melville Peninsula and parts of Northwestern and central Baffin Island; G.S.C., Bulletin 251.













Indian and Northern  
Affairs Canada

Affaires indiennes  
et du Nord Canada

# Oil and Gas Activities 1978

CAI  
IA 61  
-  $\phi$  32







# Oil and Gas Activities 1978

(Edition No. 15)

Government  
Publications

## **Report on the Activities in 1978 of the Oil and Gas Industry in the Yukon Territory and Northwest Territories**

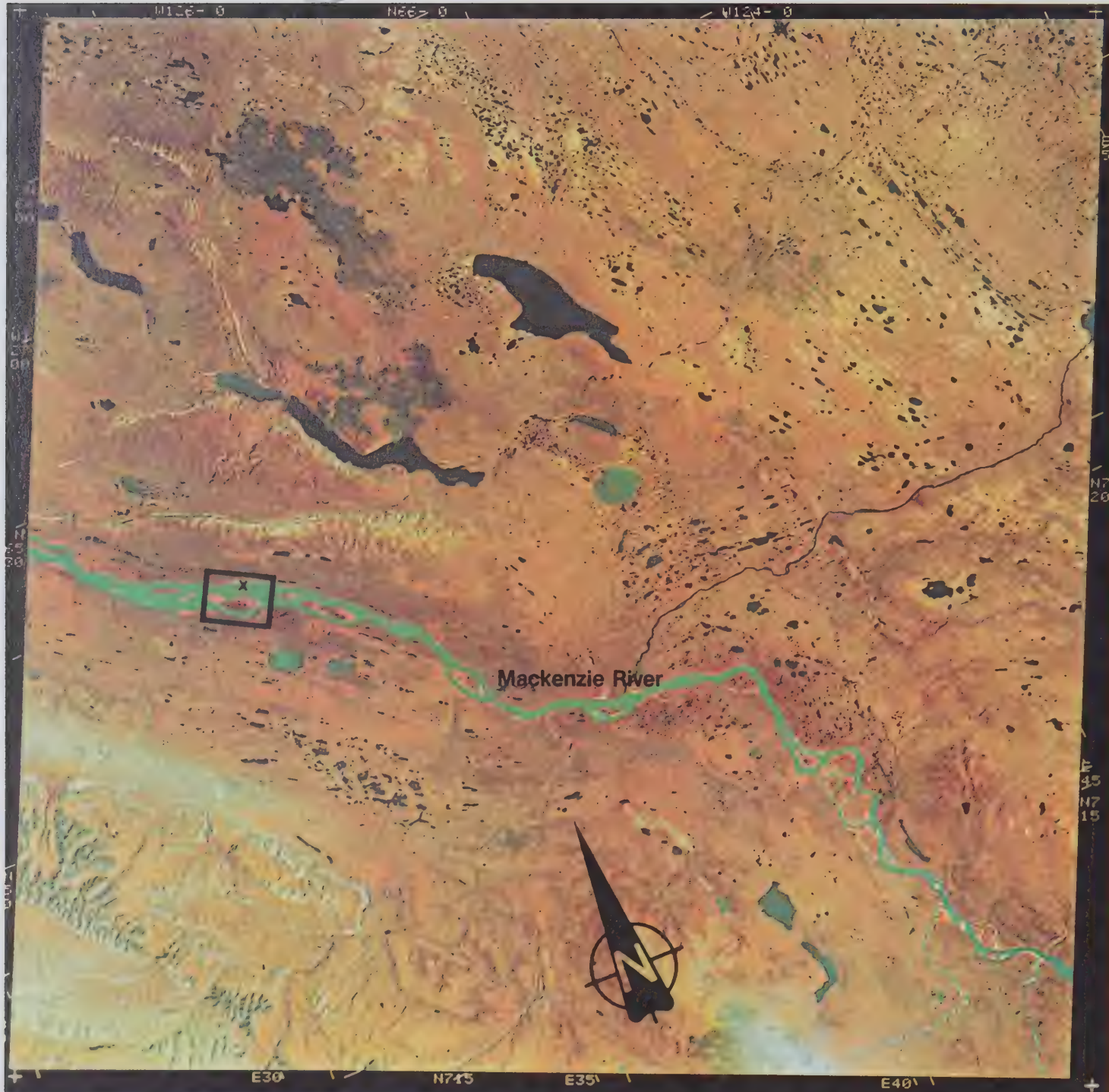
Compiled by Oil and Gas Exploratory Operations  
Section  
Northern Non-Renewable Resources Branch

© Published under authority of the  
Hon. Jake Epp, Minister  
of Indian Affairs and Northern Development Canada,  
Ottawa, 1979.  
QS-8228-000-EE-A1  
Catalogue No. R71-6/1978  
ISBN O-662-10667-9

Cette publication peut aussi être obtenue en français

*The official name of this department, according to the Government Organization Act, is the Department of Indian Affairs and Northern Development (DIAND). In recent years there has been a tendency to abbreviate these longer names for general convenience, and DIAND is often referred to as Indian Affairs and Northern Development (IAND) or as Indian and Northern Affairs (INA) – although frequently the term Department is retained, giving the initials DINA. Any of these four groups of initials is acceptable and often, as in this report, may be used interchangeably.*

Norman Wells Oil Field and Refinery (indicated "x")  
Scale 1:1 000 000 approx.





# Table of Contents

<b>6</b>	<b>Preface</b>	<b>51</b>	<b>Production, Processing, Refining</b>
<b>7</b>	<b>Summary</b>	51	Oil
<b>9</b>	<b>Introduction</b>	51	Gas
<b>11</b>	<b>Oil and Gas Discoveries and Reserves</b>	<b>42</b>	<b>Pipelines</b>
12	Geological Provinces North of 60 and the Oil and Gas Discoveries there to end of 1978	52	The Foothills Project
18	Report of the Reserves Committee of the Canadian Petroleum Association 1978	53	<i>Route and Mileages of the Northern Pipeline</i>
19	Summary of Oil and Natural Gas Resources of Canada	53	The Polar Gas Project
<b>20</b>	<b>Land Administration</b>	54	Petro-Canada Arctic Liquefied Natural Gas (LNG) Pilot Project
<b>23</b>	<b>Act and Regulations</b>	<b>56</b>	<b>Participation and Research Projects</b>
23	Canada Oil and Gas Act	56	Geophysical Surveys
24	Canada Oil and Gas Land Regulations	56	Research Programs
24	Canada Oil and Gas Geophysical Regulations	56	Arctic Petroleum Operators Association (APOA) EAMES
24	Canada Oil and Gas Drilling Regulations	<b>59</b>	<b>Appendix I</b>
28	Canada Oil and Gas Production Regulations		Sources of information relative to oil and gas activity North of 60
28	Land Use Regulations	<b>75</b>	<b>Appendix II</b>
28	Metrication in the Oil and Gas Industry		Directives
28	Offshore Structures Regulations	<b>77</b>	<b>Appendix III</b>
<b>29</b>	<b>Revenues</b>		Reporting forms
<b>35</b>	<b>Exploration, Discoveries and Drilling Operations</b>	<b>79</b>	<b>Appendix IV</b>
35	Exploration		Summaries of the Geological Provinces
	<i>Geological and Geophysical Surveys</i>	<b>82</b>	<b>Appendix V</b>
35	<i>Seismic Land Surveys</i>		Selected Geological References
35	<i>Seismic Marine Surveys</i>		
35	Discoveries		
39	Drilling		
39	<i>1979 Forecast</i>		
<b>48</b>	<b>Net Cash Expenditures of Industry in 1978</b>		



# Tables and Illustrations

## Tables

11	Table 1.	Area and volume sediments
18	Table 2.	Canadian Petroleum Association
19	Table 3.	Summary of Oil and Natural Gas Resources of Canada – 1975
20	Table 4.	Number of issued permits and leases with acreage as of December 31, 1978
31	Table 5.	Gross revenue, oil and gas (calendar year)
33	Table 6.	Gross revenue, oil and gas (fiscal year)
38	Table 7.	1973-1978 exploration survey statistics
40	Table 8.	Drilling Statistics for 1978
48	Table 9.	Net Cash Expenditures by Industry in 1977 (final)
49	Table 10.	Net Cash Expenditures by Industry in 1978 (Preliminary)
52	Table 11.	Structure of Foothills Pipe Lines Ltd.

## Illustrations

42	Oil and Gas fields and discoveries (map) centrefold
10	Figure 1. Geological Provinces (map)
21	Figure 2. Area held under oil and gas permit
22	Figure 3. Acreage under lease – by year
25	Figure 4. Permit terms and work requirement zones
26	Figure 5. Permit terms and deposit requirements – per acre
27	Figure 6. Flow diagram of disposal of oil and gas rights
30	Figure 7. Gross revenue, oil and gas (calendar year)
32	Figure 8. Gross revenue, oil and gas (fiscal year)

34	Figure 9. Value of work bonus tenders – oil and gas
36	Figure 10. Exploratory activity – geological crew months – land seismic crew months
37	Figure 11. Exploration activity – seismic line miles
41	Figure 12. Wells completed or abandoned in 1978 – southern N.W.T. and Y.T. (map)
44	Figure 13. Wells completed or abandoned in 1978 – Mackenzie Delta/Beaufort Sea (map)
45	Figure 14. Wells completed or abandoned in 1978 – Arctic Islands (map)
46	Figure 15. Wells drilled
47	Figure 16. Depths drilled
50	Figure 17. Oil and gas exploration expenditures submitted for work credits
55	Figure 18. Northern pipelines (map)
58	Figure 19. Eastern Arctic Marine Environmental Survey (EAMES) Area
62	Figure 20. District boundaries

## Photographs

<i>Frontispiece</i>	Satellite photograph of the Norman Wells field and area
11	Photo 1. Canmar Explorer III in Beaufort Sea
23	Photo 2. Drilling seismic holes in the Arctic Islands
29	Photo 3. Drilling Taglu C-42 well on Richards Island
35	Photo 4. GSI Mariner, seismic ship in Beaufort Sea
53	Photo 5. Trenching through ice for pipe laying
57	Photo 6. Helicopter services seismic drilling units on Arctic Islands



# Preface

This report covers oil and gas activities North of 60 for the year 1978. All aspects of these operations in the Yukon and Northwest Territories are administered by the Northern Non-Renewable Resources Branch, Department of Indian and Northern Affairs. It is the intent of the Department to provide for the orderly exploration and exploitation of oil and gas, thereby achieving local benefits to the specific areas involved as well as benefitting the people of Canada in general through the revenues accruing to the Crown.

As of March 1, 1979 the Minister and departmental officers responsible for the administration of oil and gas resources in the Northwest Territories, Yukon Territory and the northern offshore areas were:

Minister – The Honourable J. Hugh Faulkner  
Deputy Minister – Arthur Kroeger  
Assistant Deputy Minister (Northern Affairs) – E.M.R. Cotterill  
Director, Northern Non-Renewable Resources Branch – Dr. H.W. Woodward

## **Oil and Gas Lands Division**

Chief – P. Sullivan

Head, Oil and Gas Rights Section – J.A.S. Barrett

Head, Production and Royalty Section – Appointment pending

## **Oil and Gas Resource Evaluation Division**

A/Chief – S.A. Kanik

Head, Oil and Gas Exploratory Operations Section – S.A. Kanik

## **Oil and Gas Engineering Division**

Chief – Appointment pending

Head, Drilling and Completion Engineering

Section – M.K. El-Defrawy

Head, Reservoir Engineering Section – Appointment pending

Head, Pipelines Engineering Section – Appointment pending

Scientific Research and Special Projects

Co-ordinator – I.M. Feldman

Regional Oil and Gas Conservation Engineer, N.W.T. (Yellowknife) – M.D. Thomas

Regional Oil and Gas Conservation Engineer, Y.T. (Whitehorse) – G.E. Blue

District Oil and Gas Conservation Engineer

- for Arctic Islands, District 1, N.W.T., (in Yellowknife) – B.N. Berry

- for Southern Sector, N.W.T., District 2, N.W.T., (in Yellowknife) – Appointment pending

- for Northern Sector, N.W.T., District 3, (in Inuvik) – D.R. Whitehead

# Summary

Oil and gas exploration in Canada North of 60° showed a decline in 1978 over the same activity the previous year. No significant discoveries were made in the Arctic Islands, although two wells recovered gas, (Roche Point 0-43 abandoned and Drake Point K-79 suspended after subsea production tests); two discoveries in the Mackenzie Delta, (Isserk E-27 and Garry G-07) were abandoned as gas wells, and one development well (Kotanelee E-37) was completed as a gas well in the Yukon. Dome continued drilling operations in the Beaufort Sea and further testing in the Ukalerk 2C-50 and Kopanoar M-13 wells in 1979 hopefully will provide encouraging results. Two operators have finalized plans to drill two tests in the Davis Strait during the summer of 1979. Three wells in the Arctic Islands were drilled on ice-islands and one, Whitefish H-63 drilled by Panarctic for the AIEG consortium discovered a major gas field.

The disposition and administration of Canada Oil and Gas Rights are governed by the Canada Oil and Gas Land Regulations. These Regulations were amended in August and November, 1977, implementing some of the policy elements of the Statement of Policy announced by the Ministers of Energy, Mines and Resources and of Indian and Northern Affairs in May, 1976.

Among other things, the amended regulations provided for preferential rights for Petro-Canada to acquire oil and gas rights to Crown reserve lands on a non-competitive basis, as well as to acquire working interests in discretionary extensions of existing permits. Under these provisions Petro-Canada made initial selection of Crown Reserve acreage in the Eastern Arctic offshore and in the Arctic Islands, however selections were deferred in the Western Arctic to facilitate negotiations of native claims. Additionally Petro-Canada has chosen to participate in a number of the Special Renewal Permits granted in the Beaufort Sea-Mackenzie Delta area. The amended regulations ended the earlier embargo on the issuance of oil and gas leases, some of which has been held in abeyance since 1972 and provided the lease applicants with the option of acquiring leases, special renewal permits, or surrendering his application.

During 1978 the elections made under Regulations and the large number of permits converted to Special Renewal Permit resulted in the issuing of nearly 1,000 special renewal permits, and some 2,000 lease applications were issued or withdrawn. As well, six leases containing drilling commitments were issued to operators to encourage drilling of areas contiguous to existing leases.

The proposed legislation incorporating all of the elements of the joint Ministerial statement of policy for oil and gas rights disposition is expected to be re-introduced in Parliament in 1979. The original legislative proposal (Bill C-20 tabled in December 1977) was reviewed during 1978 and some minor revisions reflecting industry's concerns have been made.

With the continuing exploration interest in the Beaufort Sea, Mackenzie Delta area, the Arctic Islands and the Eastern Arctic offshore some 80 million hectares of oil and gas rights are being maintained by industry, 77 million hectares in permits and three million hectares in leases. The total acreage held under oil and gas rights declined about 20% during the year, as rights in the less prospective areas were surrendered or expired.

Drilling activities showed a 35% decline from the 1977 levels, a situation that was not unexpected in view of the 1977 decline of the geophysical activity. Drilling continued in the Beaufort Sea where the use of a Government icebreaker made the extension of the drilling season possible. Because the wellsites now being considered lie for the most part in more distant and difficult terrains than those of former years, the cost of operations has risen by at least 15% per year although the amount in exploration and drilling has decreased. Geophysical activities decreased on land areas in 1978 but remained the same in marine areas as in 1977.

During 1978 gas was produced in the Northwest Territories at the Pointed Mountain field and at the Beaver River field in the Yukon, this gas was processed at Fort Nelson, B.C. Oil continues to be produced and processed at Norman Wells with 39 wells producing regularly during 1978. Drilling was being carried out in the Norman Wells field to provide reservoir and productivity information for that portion of the field below the Mackenzie River so that a water flood program can be initiated in 1979 to increase oil production and conserve reservoir energy.

Plans for construction of the Foothills Pipe Line from Prudhoe Bay through Alaska, the Yukon and three western provinces to the lower 48 states made progress during 1978. The target date for the commencement of operations is now 1984, construction to begin in 1981. The Dempster lateral from the Mackenzie Delta to the main Foothills line, may be built in the late 1980's if the demand is shown for Canadian gas. Also under consideration is the construction of a pipeline from the Arctic Islands to southern Canada and the establishment of a tanker route from the Arctic Islands to transport liquefied natural gas (LNG) to ports on Canada's eastern coast.

In 1978, the Reserves Committee of the Canadian Petroleum Association redefined their estimate of proven reserves of gas in the area North of 60° to 18.07 tcf and Canada's total to 82.424 tcf. Major recoverable oil reserves are in Norman Wells field and Delta, the total for all pools and field is 66.7 M bbls.

There were fewer participants in research projects in 1978. The outstanding ones being those connected with the Eastern Arctic Marine Environmental Studies (EAMES) which were initiated in 1977 and will be completed in 1979 for total costs in excess to \$12 million. These studies provided the government with environmental data to approve two drilling authorities in the Eastern Arctic under strict drilling constraints.

Arrangements for the complete conversion of the industry to SI (Système International) units by 79-01-01 were continued under the program approved by the Metric Commission in December 1976.



# Introduction

During 1978, the international situation regarding oil and gas supplies continued to be so uncertain that hydrocarbon deposits previously considered too uneconomical now merited more favourable consideration. The outstanding case continues to be the Alberta tar sands which, although still expensive to develop, are now economically worth while. Potential areas like the Davis Strait and Sverdrup Basin are now viable if adequate reserves are found.

Activity in the area North of 60 has shown a continuation of the decline which began there in about 1974, while interest has been mainly focussed on the more southerly parts of Canada – particularly the western provinces. This is shown by the decline in the number of new wells drilled and the depths to which they are drilled. The amount of money invested by Industry in the area North of 60 in 1978 came to approximately 5% of the total spent in Canada as a whole.

Work in the area North of 60 is now being concentrated almost exclusively either in the “high potential” areas of Beaufort Sea and Davis Strait or in areas of proven resources such as the Mackenzie Delta or Sverdrup Basin.

Figure 1  
Geological Provinces



# Oil and Gas Discoveries and Reserves

The area of Canada North of 60 covers roughly 3,800,000 square kilometres of which nearly one-third, about 1,204,000 square kilometres, are underlain by sedimentary rocks. A comparison of the area and volume of sediments in the Western Provinces, the Yukon and the Northwest Territories (including the Arctic Islands) is given in Table 1.

(Table 1)

For convenient reference, the area has been divided into thirteen major *geological provinces* and a number of *sub-provinces* as shown in Figure 1. More details of these geological *provinces* are given in Appendix IV, *Summaries of the Geological Provinces*. A short list of relevant references to the geology of the area is given in Appendix V. The discoveries map (at centre fold) shows the location of all oil and gas fields, including the 1978 discoveries.

The distribution of oil and gas discoveries and recoveries, and the potential for future discoveries in the various geological provinces is outlined in the table showing oil and gas discoveries to the end of 1978. An asterisk to the left of the well name indicates discovery or recovery of hydrocarbons in 1978.



Canmar Explorer III in Beaufort Sea

**Table 1 — Area and Volume of Sediments**

<i>Region</i>	<i>Total Area (Sq. Miles)</i>	<i>Volume of Sediments (Cu. Miles)</i>	<i>Total Area (Sq. Kilometres)</i>	<i>Volume of Sediments (Cu. Kilometres)</i>
Manitoba & Saskatchewan	220 000	165 000	570 000	688 000
Alberta	224 700	333 400	582 000	1 390 000
British Columbia	138 500	298 000	359 000	1 242 000
Yukon & Northwest Territories Mainland	541 500	421 000	1 402 000	1 755 000
Arctic Archipelago	644 600	1 275 000	1 670 000	5 314 000
	1 769 300	2 492 400	4 583 000	10 389 000



**Geological Provinces North of 60 and the Oil and Gas discoveries there to end of 1978**  
 (\* indicates discovery/recovery in 1978).

1. Arctic Stable Platform – only four wells have been drilled to date, all unsuccessful.
2. Franklinian Geosyncline – significant quantities of light gravity crude oil have been recovered from Middle Devonian carbonates on Cameron Island.

<i>Well Name</i>	<i>Location</i>	<i>Well Status</i>	<i>Reserve Status</i>	<i>Horizon</i>	<i>Lithology</i>	<i>Spud Date</i>	<i>Completion Date</i>	<i>Potential</i>
<b>Cameron Island</b> Panarctic et al Bent Horn N-72	N-72-76-30-103-30	Potential Oil & Gas Well	Oil Show	Blue Fiord	Carbonate	24-11-73	06-04-74	500 BOPD on test
Panarctic et al Bent Horn F-72A	F-72-76-30-103-30	Potential Oil & Gas Well	Oil Show	Blue Fiord	Carbonate	21-05-75	19-12-75	445 Bbls oil DST
Panarctic et al Bent Horn A-02	A-02-76-30-104-00	Potential Oil & Gas Well	Oil Discovery	Blue Fiord	Carbonate	06-05-76	01-08-76	Max. 7900 BOPD on production test

3. Sverdrup Basin – seven *gas fields* have been discovered to date. Recoveries of *crude oil* have been recorded from Ellesmere and Thor Islands.

**Gas Discoveries**

<b>Melville Island</b> Panarctic Drake Point N-67	N-67-76-30-108-30	Abandoned	Gas Discovery	Jurassic	Sandstone	14-04-69	02-09-69	Abandoned after blowout
Panarctic Drake Point L-67	L-67-76-30-108-30	Potential Dual Gas	Gas Dev.	Jurassic Bjorne	Sandstone	28-09-69	28-02-70	DST 10 MMCF (Jurassic)
Panarctic et al Drake F-16	F-16-76-30-108-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	10-05-72	16-06-72	AOF 265 MMCFD
Panarctic et al Drake B-44	B-44-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	23-09-72	22-10-72	DST 5.5 MMCFD
Panarctic et al Drake D-68	D-68-76-30-108-30	Potential Gas	Gas Dev.	Jurassic Bjorne	Sandstone Sandstone	07-06-73	25-03-74	DST 8.7 MMCFD DST 40.1 MCFD
Panarctic et al Drake E-78	E-78-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	02-05-74	27-05-74	DST 4.8 MMCFD
Panarctic et al Drake D-73	D-73-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	23-04-75	10-05-75	DST 8.1 MMCFD
Panarctic et al Drake F-76	F-76-76-30-108-00	Suspended Gas	Gas Dev.	Jurassic	Sandstone	02-03-78	30-04-78	AOF 77 MMCF @ 12.75 P.S.I.
Panarctic et al East Drake I-55	I-55-76-30-107-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	06-03-75	16-04-75	AOF 58 MMCF critical flow proved
Panarctic et al W. Hecla N-52	N-52-76-30-110-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	05-03-74	15-04-74	AOF 52 MMCFD
Panarctic et al E. Hecla F-62	F-62-76-30-110-00	Potential Gas	Gas Discovery	Jurassic	Sandstone	11-11-72	12-12-72	AOF 96 MMCFD
Panarctic et al Hecla I-69	I-69-76-20-110-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	22-02-73	11-04-73	DST 7.8 MMCFD
Panarctic et al E. Hecla C-32	C-32-76-30-110-00	Potential Gas	Gas Discovery	Jurassic	Sandstone	07-11-75	10-12-75	DST 8.5 MMCFD

Panarctic et al W. Hecla P-62	P-62-76 30-110-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	07-01-76	22-02-76	DST 5.3 MMCFD
Panarctic W. Hecla M-25	M-25-76 30-111-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	14-03-76	18-04-76	DST 5.4 MMCFD
* Panarctic et al Roche Pt. O-43	O-43-75 50-109-30	Abandoned Gas	Gas Discovery	Triassic	Sandstone	18-01-78	18-04-78	–
<b>Thor Island</b> Panarctic et al Thor H-28	H-28-78 10-103-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	28-02-73	10-05-73	Flow test to 55 MMCFD
<b>Ellef Ringnes Island</b> Panarctic et al Kristoffer Bay B-06	B-06-78 20-102-30	Potential Gas	Gas Discovery	Heiberg	Sandstone	09-11-71	17-03-72	DST 10 MMCFD
Panarctic et al Jackson Bay G-16A	G-16-78 10-101-00	Potential Gas	Gas Discovery	Heiberg	Sandstone	16-03-76	30-04-76	DST 7.34 MMCFD
<b>King Christian Island</b> Panarctic King Christian D-18	D-18-77- 50-101-00	Abandoned	Gas Discovery	Heiberg	Sandstone	14-10-70	25-01-71	Abandoned after blowout
Panarctic King Christian D-18A	D-18-77- 50-101-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	26-11-70	15-03-71	AOF 264 MMCFD
Panarctic et al King Christian N-06	N-06-77- 50-101-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	13-05-71	20-09-71	AOF 340 MMCFD
Dome Arctic Ventures Wallis K-62	K-62-78- 00-102-00	Potential Gas	Gas Discovery	Heiberg	Sandstone	27-11-72	21-02-73	DST 12.43 MMCFD

#### Crude Oil Recoveries

##### **Ellesmere Island**

Panarctic Romulus C-42	C-42- 80-00 84-00	Suspended	Oil & Gas Show	Jurassic Schei Point Bjorne	Sandstone	29-01-72	25-07-72	Area has potential
---------------------------	-------------------------	-----------	-------------------	--------------------------------------	-----------	----------	----------	-----------------------

##### **Thor Island**

Panarctic et al Thor P-38	P-38-78- 10-103-00	Suspended	Oil Show	Heiberg	Sandstone	06-04-72	10-05-72	Thin Oil leg on water
------------------------------	-----------------------	-----------	----------	---------	-----------	----------	----------	--------------------------

---

4. Arctic Coastal Plain – no successful wells to date.

5. Banks Basin – no hydrocarbon discoveries to date, but the area is considered to have a moderate potential for hydrocarbon accumulation.

6. Baffin Bay/Davis Strait – this “province” lies entirely offshore and to date has been explored by regional geo-physical surveys. It contains several areas that hold promise for future hydrocarbon discoveries: the Thule Basin off Greenland, Lancaster Delta, Home Bay Delta, Cumberland Delta, Lancaster Sound and Jones Sound.

7. Mackenzie/Beaufort Basin – oil and gas have been found in Paleozoic carbonates and in Lower Cretaceous and Tertiary sands. All these finds are in the Mackenzie Delta Section, Adgo and Netserk being offshore.

---

#### Crude Oil Discoveries

##### **Mackenzie Delta – Tuktoyaktuk Peninsula**

IOE Atkinson H-25	H-25-69- 50-131-45	Abandoned	Potential Oil Well	Lower Cretaceous	Sandstone	14-12-69	26-02-70	3150 BOPD calc. 24.3° API
IOE Mayogiak J-17	J-17-69- 30-132-45	Abandoned	Potential Oil Well	Devonian & Lower Cretaceous	Carbonate & Sandstone	03-04-71	06-08-71	7320 BOPD 33.6° API
Imp. Ivik J-26	J-26-69- 40-134-15	Suspended	Potential Oil & Gas Well	Tertiary	Sandstone	08-04-72	30-09-72	5345 BOPD calc. 24° API

Imp. Ivik K-54	K-54-69-40-134-15	Abandoned	Potential Oil	Tertiary	Sandstone	30-03-73	08-06-73	829 BOPD calc. 24° API
Imp. Adgo F-28	F-28-69-30-135-45	Plugged & Abandonbed	Gas & Oil	Tertiary	Sandstone	28-12-73	19-03-74	1500 BOPD 17.5° API
Shell Kugpik O-13	O-13-69-20-135-15	Suspended	Oil	Lower Cretaceous	Sandstone	26-03-73	30-09-73	2900 BOPD 50° API
Shell Kumak J-06	J-06-69-20-135-00	Suspended	Oil	Tertiary	Sandstone	24-11-73	01-05-74	5000 BOPD 27.1° & 31.3° API
Shell Niglntgak M-19	M-19-69-20-135-15	Suspended	Oil & Gas	Tertiary	Sandstone	01-06-74	25-01-75	O.T.S. 18.8–32° API
Sun et al Garry P-04	P-04-69-30-135-30	Suspended	Oil & Gas	-	-	25-08-75	05-01-76	O.T.S. DST
Gulf Mobil Kamik D-48	D-48-69-00-133-15	Suspended	Oil & Gas	Lower Cretaceous	Sandstone	23-12-75	04-04-76	O.T.S. DST
<b>Beaufort Sea</b> Dome Hunt Nektoralik K-59	K-59-70-30-136-00	Abandoned	Oil & Gas	-	-	08-08-77	17-10-77	-
<b>Gas Discoveries</b>								
<b>Mackenzie Delta – Tuktoyaktuk Peninsula</b>								
Gulf Mobil Parsons F-09	F-09-69-00-133-30	Suspended	Gas & Condensate	Lower Cretaceous	Sandstone	20-01-71	19-04-72	17.2 MMCFD DST
Gulf Mobil Parsons N-10	N-10-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	14-02-73	29-05-73	FT 34 MMCFD
Gulf Mobil Parsons L-37	L-37-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	26-12-76	02-04-77	22.8 MMCFD DST
Gulf Mobil Parsons P-41	P-41-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	29-12-76	05-04-77	6.75 MMCFD DST
Gulf Mobil Parsons A-44	A-44-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	09-04-75	22-07-75	15 MMCFD DST
Gulf Mobil Parsons P-53	P-53-69-00-133-30	Suspended	Gas & Condensate	Lower Cretaceous	Sandstone	22-12-73	09-04-74	8.3 MMCFD DST
Gulf Mobil Parsons O-27	O-27-69-00-133-30	Suspended	Gas	Cretaceous	Sandstone	23-03-74	30-08-74	2.7 MMCFD DST
Gulf Mobil Parsons L-43	L-43-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	10-12-75	04-03-76	27.7 MMCFD DST
Gulf Mobil Parsons N-17	N-17-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	18-12-75	13-04-76	22.5 MMCFD DST
Gulf Mobil Parsons D-20	D-20-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	21-04-76	22-11-76	20.5 MMCFD DST
Gulf Imp. Shell Reindeer F-36	F-36-69-10-134-30	Suspended	Gas	Tertiary	Sandstone	13-03-73	05-06-73	4.87 MMCFD DST
Gulf Mobil Siku C-11	C-11-69-10-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	26-12-75	22-03-76	31 MMCFD Calc.
Gulf Mobil Siku A-12	A-12-69-10-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	14-04-76	26-07-76	47 MMCFD (est) DST
Gulf Mobil Siku E-21	E-21-69-10-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	17-04-77	21-06-77	28.9 MMCFD DST
Gulf Imp. Shell Titalik K-26	K-26-69-10-135-00	Abandoned	Gas	Tertiary	Sandstone	17-10-72	20-02-73	14.05 MMCFD DST
Gulf Mobil Ya Ya A-28	A-28-69-20-134-30	Suspended	Gas	Tertiary	Sandstone	28-02-74	06-07-74	11.3 MMCFD DST



Gulf Mobil Ya Ya P-53	P-53-69- 20-134-30	Suspended	Gas	Tertiary	Sandstone	08-12-72	20-03-73	8.1 MMCFD DST
IOE Taglu G-33	G-33-69- 30-134-45	Suspended	Gas	Tertiary	Sandstone	13-04-71	18-08-71	28.7 MMCFD DST
IOE Taglu C-42	C-42-69- 30-134-45	Suspended	Condensate & Gas	Eocene	Sandstone	30-04-72	18-11-72	24.5 MMCFD Calc.
IOE Taglu W. P-03	P-03-69- 30-135-00	Suspended	Gas	Eocene	Sandstone	12-12-71	29-03-72	6.3 MMCFD Max. flow rate
IOE Taglu D-43	D-43-69- 30-134-45	Suspended	Gas	Eocene	Sandstone	23-03-73	11-09-73	AOF 30.3 MMCFD
IOE Mallik L-38	L-38-69- 30-135-00	Abandoned	Potential Gas	Tertiary	Sandstone	24-12-71	05-04-72	8.84 MMCFD CCT. calc.
Imp. Taglu H-54	H-54-69- 30-134-45	Suspended	Gas	Tertiary	Sandstone	02-12-76	05-04-77	2.5 MMCFD DST
Imp. Netserk F-40	F-40-69- 40-135-45	Suspended	Gas	Tertiary	Sandstone	08-11-75	09-05-76	8.9 MMCFD DST
Shell Kumak K-16	K-16-69- 20-135-00	Suspended	Gas	Tertiary	Sandstone	23-02-75	13-07-75	11.9 MMCFD DST
Shell Kumak E-58	E-58-69- 30-135-00	Suspended	Gas	Tertiary	Sandstone	28-02-77	08-06-77	17.1 MMCFD DST
Shell Niglintgak H-30	H-30-69- 20-135-15	Suspended	Gas (DST)	Tertiary	Sandstone	24-10-72	07-04-73	15.9 MMCFD DST
Shell Niglintgak B-19	B-19-69- 20-135-15	Suspended	Gas	Tertiary	Sandstone	18-10-75	22-02-76	8.6 MMCFD DST
Sun et al Garry P-04	P-04-69- 30-135-30	Suspended	Oil & Gas	Tertiary	-	25-08-75	05-01-76	17.4 MMCFD DST
* Sun et al Garry G-07	G-07-69 30-135-30	Suspended Gas	Gas Dev.	Tertiary	Sandstone	10-02-78	13-05-78	187' Cond. DST
* Imp. Isserk E-27	E-27-70 00-134-15	Abandoned Gas	Gas Discovery	Tertiary	Sandstone	04-12-77	04-05-78	-
<b>Beaufort Sea</b> Dome Hunt Nektoralik K-59	K-59-70- 30-136-00	Abandoned	Oil & Gas	Tertiary	Sandstone	08-08-77	17-10-77	-
Dome et al Ukalerk C-50	C-50-70- 10-132-30	Abandoned	Gas	Tertiary	Sandstone	19-07-77	03-10-77	-
Dome Gulf et al Ukalerk 2C-50	C-50-70- 10-132-30	Suspended	Gas	Tertiary	Sandstone	10-07-78	16-10-78	-
Hunt Dome Kopanoar M-13	M-13-70- 30-135-00	Suspended	Gas	Tertiary	Sandstone	27-09-76	16-10-78	-

## 8. Interior Plains

**Great Slave Plain** - gas pools have been discovered in porous dolomites and limestones of Middle Devonian age.

Briggs Rabbit Lake No. 1	O-16-61- 00-118-45	Potential Gas Well	Gas Discovery	Sulphur Point	Limestone	04-02-55	30-03-55	AOF 2 MMCFD (EST)
Briggs Rabbit Lake No. 2	B-07-61- 00-118-45	Potential Gas Well	Gas Dev.	Sulphur Point	Limestone	09-02-57	14-03-57	AOF 6 MMCFD (EST)
Home Signal CSP Celibeta No. 2	H-78-60- 10-122-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	26-12-59	24-03-60	AOF 8 MMCFD
H.B. Cameron Hills A-05	A-05-60- 10-117-30	Potential Gas Well	Gas Discovery	Slave Point Sulphur Point	Limestone Dolomite	28-01-68	24-02-68	DST 8.2 MMCFD
H.B. Pan Am S. Island R. M-41	M-41-60- 10-121-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	03-02-64	23-04-64	DST 5.7 MMCFD

H.B. Amoco S. Island R. M-52	M-52-60- 10-121-00	Abandoned	Gas Dev.	Slave Point	Limestone	21-01-73	21-02-73	DST 1.3 MMCFD
Pacific Amoco Tathlina N-18	N-18-60- 20-118-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	28-01-73	19-02-73	DST 1.8 MMCFD
Shell H.B. Grumbler G-63	G-63-60- 20-115-45	Abandoned	Potential Gas Discovery	Slave Point	Limestone	14-02-69	16-03-69	DST 10 MMCFD
Sun Netla C-07	C-07-60- 50-122-45	Potential Gas Well	Gas Discovery	Sulphur Point	Limestone	20-01-61	05-04-61	AOF 24 MMCFD
Texaco Bovie Lake J-72	J-72-60- 10-122-45	Potential Gas Well	Gas Discovery	Nahanni	Dolomite	06-01-70	18-01-70	DST 2.6 MMCFD
Union Pan Am Trainor C-39	C-39-60- 20-120-30	Potential Gas Well	Gas Discovery	Sulphur Point	Carbonate	29-01-65	15-03-65	DST 8 MMCFD

**Great Bear Plain** – no discoveries to date.

**Mackenzie Plain** – oil is still produced at Norman Wells from the Devonian Kee Scarp formation and additional hydrocarbon shows have been encountered in the Cretaceous and Silurian age of formations of this “province”.

#### Crude Oil Discoveries

##### **Norman Wells Oil Field**

Northwest Discovery No. 1	P-37-65- 20-126-45	Abandoned	Oil Discovery	Devonian Canol	Fractured Shale	14-04-20	1923	12 bbl/day
Northwest Discovery No. 2	P-37-65- 20-126-45	Abandoned	Oil Discovery	Kee Scarp (Givetian)	Limestone	07-24	08-24	75 bbl/day
* Esso Norman Wells (36X) B-48	B-48-65 20-126-45	Oil Well	Oil Dev.	Kee Scarp	Carbonate	25-10-78	12-12-78	–

74 additional wells were drilled to develop field.

**Peel Plain** – no discoveries here as yet, but hydrocarbon shows have been encountered in Lower Devonian formations.

**Anderson Plain** – one gas discovery has been made at Tedji Lake, and several other hydrocarbon shows have been encountered.

Ashland et al Tedji Lake F-24	F-24-67- 50-126-45	Suspended	Gas	Basal Cambrian	Sandstone	13-02-74	31-03-74	DST 4.5 MMCFD
----------------------------------	-----------------------	-----------	-----	-------------------	-----------	----------	----------	------------------

9. Liard Plateau and Range – gas is being produced in this *province* at the Beaver River (B.C. portion) and Pointed Mountain fields from dolomites of the Nahanni Formation of Middle Devonian age. The Beaver River field (Y.T. portion) produced gas from Mississippian sands. Gas has also been discovered at North Beaver River and La Biche.

##### **Northwest Territories**

C.P.O.G. et al La Biche F-08	F-08-60- 40-124-30	Suspended	Gas Discovery	Middle Devonian	Argillaceous Limestone	25-02-71	19-03-71	DST 2.9 MMCFD
Pan Am Pointed Mountain G-62	G-62-60- 30-123-45	Gas Well	Gas Dev.	Middle Devonian Carbonate	Dolomite	09-07-68	23-06-69	Flow back 12 MMCFD
Pan Am Pointed Mountain K-45	K-45-60- 30-123-45	Gas Well	Gas Dev.	Middle Devonian Carbonate	Dolomite	15-09-67	08-05-68	AOF 75.6 MMCFD
Pan Am Pointed Mountain O-46	O-46-60- 30-123-45	Gas Well	Gas Dev.	Devonian Nahanni	Dolomite	29-03-69	02-10-71 Extended Standby	AOF 19.43 MMCFD
Pan Am Pointed Mountain P-53	P-53-60- 30-123-45	Gas Well	Gas Discovery	Devonian Nahanni	Dolomite	06-02-66	22-02-67	AOF 70.22 MMCFD
Amoco B-2 Pointed Mountain F-38	F-38-60- 30-123-45	Gas Well	Gas Dev.	Devonian Nahanni	Dolomite	22-08-72	07-10-73	AOF 29 MMCFD
Amoco Pointed Mountain A-55	A-55-60- 30-123-45	Gas Well	Gas Dev.	Devonian Nahanni	Dolomite	01-03-74	08-08-74	Production tested 4.5 MMCFD

<b>Yukon Territory</b> Canada Southern et al North Beaver YT I-27	I-27-60- 10-124-00	Suspended	Extension Test Gas Well	Middle Devonian	Carbonate	24-03-63	29-09-64	AOF 1.5 MMCFD
Columbia Gas et al Kotaneelee H-38	H-38-60- 10-124-00	Suspended	Gas Dev.	Middle Devonian	Carbonate	06-04-77	29-10-77	Production tested 21 MMCFD
* Columbia et al Kotaneelee E-37	E-37-60 10-124-00	Suspended Gas Well	Gas Dev.	Middle Devonian	Carbonate	21-01-78	05-12-78	
Pan Am Beaver River YT G-01	G-01-60- 10-124-15	Gas Well	Gas Producer	Missis- sippian & Nahanni	Sandstone and Car- bonate	12-06-68 AOF 39.54	10-03-69	AOF 6.77 MMCFD

10. Eagle Plain – significant hydrocarbon shows have been encountered, but no commercially interesting discoveries have been reported.

Canoe River Chance YT J-19	J-19-66- 10-137-30	Potential Gas & Oil	Gas & Oil Discovery	Carbon- iferous Hart River	Conglom- eratic Sandstone	14-12-67	17-02-68	DST 6.52 MMCFD
Socony Mobil WM Chance YT G-08	G-08-66- 10-137-30	Potential Oil Well	Gas & Oil Discovery	Cretaceous Carbon- iferous Hart River	Sandstone Conglo- meratic Sandstone	04-12-64	15-02-65	DST 3.3 MMCFD 1180' oil
Socony Mobil WM Birch YT B-34	B-34-66- 10-136-45	Potential Gas Well	Gas Discovery	Carbon- iferous Hart River	Conglo- meratic Sandstone	04-08-64	06-08-65	DST 7.3 MMCFD
Socony Mobil WM Blackie YT No. 1 M-59	M-59-66- 00-137-00	Potential Gas Well	Gas Discovery	Permian	Conglo- meratic Sandstone	11-12-63	27-03-64	DST 2.8 MMCFD
WM Chance YT No. 1 M-08	M-08-60- 10-137-30	Potential Gas or Oil Well	Gas & Oil Discovery	Cretaceous Carbon- iferous Hart River	Sandstone Conglo- meratic Sandstone	30-05-59	25-05-60	11/64" Choke 5 MMCFD 10.5 bbl/d

11. Peel Plateau – shows of hydrocarbons have been observed.

12. Old Crow Basin – no hydrocarbon discoveries have been made.

13. Whitehorse Plain – no hydrocarbon discoveries have been made.



## Report of the Reserves Committee of the Canadian Petroleum Association - 1978

The Reserves Committee presented its annual report on Canada's liquid hydrocarbon and natural gas reserves as of December 31, 1978. Its compilation of remaining reserves are shown in Table 2. Included in the tabulations are gas reserves for the Mackenzie Delta, which were first included in 1974, and for the Arctic Islands, first included in 1975. The Mackenzie Delta reserves are rated at 6.6 trillion cubic feet; the Arctic Islands reserves are rated at 10.8 trillion cubic feet; 0.6 trillion cubic feet are included for the southern Territories, relatively unchanged from 1977.

**Table 2 — Canadian Petroleum Association Reserves**

<i>Crude Oil</i> (Thousand Barrels)	Proved
<i>Remaining Reserves as of Dec. 31, 1978</i>	
Yukon and Northwest Territories	66,691
Canada	6,859,580
<i>Natural Gas Liquids</i> (Thousand Barrels)	
<i>Remaining Reserves as of Dec. 31, 1978</i>	
Yukon and Northwest Territories	52,777
Canada	1,446,234
<i>Total Liquid Hydrocarbons</i> (Thousand Barrels)	
<i>Remaining Reserves as of Dec. 31, 1978</i>	
Yukon and Northwest Territories	119,468
Canada	8,305,815
<i>Marketable Natural Gas</i> (trillion Cubic Feet @ 14.65 psia and 60° F)	
<i>Remaining Reserves as of Dec. 31, 1978</i>	
Yukon and Northwest Territories	18.07
Canada	82.424

## Summary of Oil and Natural Gas Resources of Canada

The Department of Energy, Mines and Resources has estimated the likelihood of existence of oil and gas resources in the various regions of Canada. These estimates are reproduced in Table 3\* and are based on data available at the end of 1975. No data changes have been published since then.

**Table 3 — Summary of Oil and Natural Gas Resources – 1975\*\***

(Remaining Reserves, Discovered Resources and Undiscovered Potential)			
<i>Region</i>	<i>Likelihood of Existence</i>		
	50/50 "High" 90% Proba- bility	Chance 50% Proba- bility	"Low" 10% Proba- bility
<i>Oil Resources</i> (billions of barrels)			
Atlantic Shelf South .....	1.2	1.9	3.0
Labrador-East Newfoundland Shelf .....	1.7	2.6	4.5
Northern Stable Platform Basins .....	0.01	.06	3.2
St. Lawrence Lowlands .....	0.04	0.09	0.2
Western Canada .....	10.9	11.7	13.5
Mainland Territories .....	0.3	0.5	1.0
Mackenzie Delta-Beaufort Sea .....	4.3	6.9	12
Sverdrup Basin .....	1.1	2.0	4.0
Arctic Fold Belts .....	0.5	1.8	4.3
Total Canada (Accessible Regions) .....	25	30	43

<i>Region</i>	<i>Gas Resources</i> (trillions of cubic feet)		
	8.6	13.2	20
Atlantic Shelf South .....	18	26.7	45
Labrador-East Newfoundland Shelf .....	0.4	2.3	12
Northern Stable Platform Basins .....	0.7	1.4	3.2
St. Lawrence Lowlands .....	89	97	107
Western Canada .....	6.0	9.7	20
Mainland Territories .....	39	60	99
Mackenzie Delta-Beaufort Sea .....	21	40	80
Sverdrup Basin .....	2.9	11	26
Arctic Fold Belts .....			

Total Canada (Accessible Regions) .....

229 277 378

*Note:* These columns do not total arithmetically to the Canada totals because individual curves must be summed using a statistical technique described elsewhere in the Geological Survey Report.

\* Extracted from Oil and Natural Gas Resources of Canada, 1976, Report EP-77-1, Department of Energy, Mines and Resources.

\*\* Prepared by Geological Survey of Canada

# Land Administration

Land Activities during 1978 continued under authority of the Canada Oil and Gas Land Regulations. Although proposed legislation (Bill C-20, the Canada Oil and Gas Act), derived from the Policy Statement of May, 1976, was tabled before Parliament in December 1977, the legislation was not continued through the summer recess. Accordingly a new bill is awaiting re-introduction at year end. Amendments to the Canada Oil and Gas Land Regulations made in 1977 did have some impact on land holdings during the year, but as no new disposals of oil and gas were held during the year, the total acreage held under leases and permits continued to decline.

The decline in the total holdings amounts to about 20% of the acreage held during 1977. As well as reflecting the maturing of permit acreages due to the passage of time, the significant decrease also reflects a concentration of exploratory acreage into more expensive, less accessible prospective areas. (See Table 4 and Figure 2). As a result the number of leases increased (Figure 3). Continued interest, primarily in the offshore areas of the Mackenzie Delta, Beaufort Sea, Arctic Islands and offshore waters of the Eastern Arctic is demonstrated by the number of permits held through their statutory terms and extended into discretionary renewal terms. About 17 million acres are held under discretionary extensions, which carry annually escalating work requirements designed to ensure the assessment of potential oil and gas reserves.

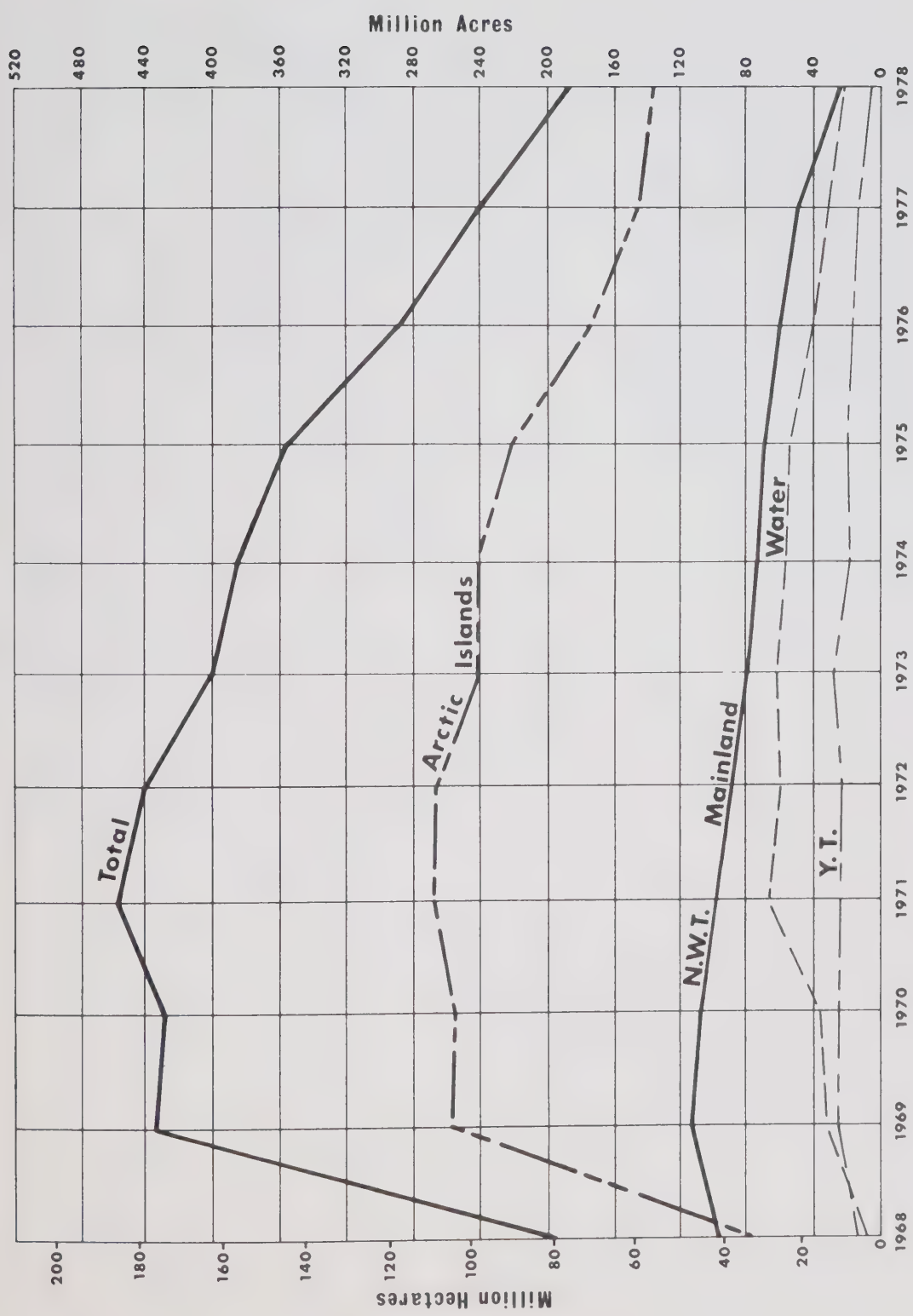
Amendments to the Regulations in 1977 provided options for holders of lease applications and expiring permits. By the end of 1978, the option period had expired, and about 1,000 leases were issued. Applications for some of these leases had been received as early as 1972 but had been held for action until the option period should expire. Six leases containing drilling commitments were also issued during 1978 to operators conducting exploratory or delineation drilling on Crown Reserve areas adjacent to existing leases. Under the acreage selection option provided by the amended Regulations, Petro-Canada selected about 27 million acres in Davis Strait and Baffin Bay and 4.5 million acres in the Arctic Islands to be held under exploration agreements. Although a preliminary selection was also made for areas in the Western Arctic, the Minister announced in May 1978 that disposals in that region would be deferred for one year to encourage discussion of native claims.

**Table 4 —** Number of issued permits and leases, and relevant acreage as of December 31, 1978

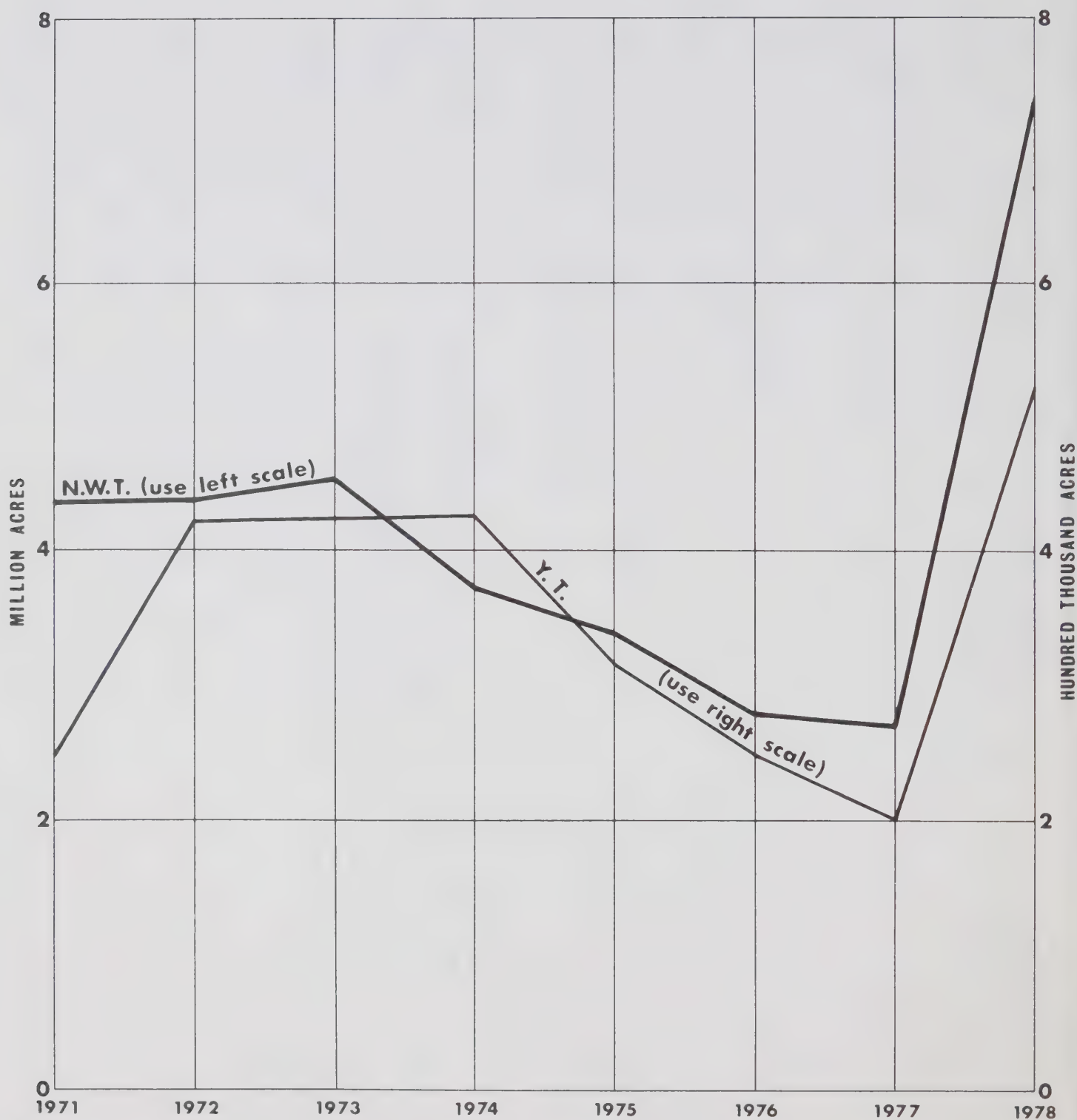
Area	Permits	Acreage	Leases	Acreage
NWT mainland	512	23,964,675	996	6,101,060
Yukon mainland	136	5,024,478	142	523,275
Arctic Islands	2,783	135,994,587	150	914,313
Arctic coast marine	525	23,420,675	47	316,473
Total	3,956	188,404,415	1,335	7,855,121



Figure 2  
Area Held Under Oil and Gas Permit  
Yukon Territory and Northwest Territories



**Figure 3**  
**Acreage Under Lease by Year**  
 Yukon Territory and Northwest Territories



# Act and Regulations

## Canada Oil and Gas Act

The original legislation, introduced in December 1977 was not continued through the 1978 summer recess, and a new bill containing minor revisions for clarity is still awaiting re-introduction. The proposed legislation embodies the legislative elements referred to in a Statement of Policy dated May, 1976, announced jointly by the Minister of Energy, Mines and Resources, and the Minister of Indian Affairs and Northern Development. In accordance with the *National Energy Strategy*, the new regime is designed to stimulate increased exploration in order to furnish the information necessary for an early assessment of Canada's hydrocarbon reserves. The legislative elements include fiscal and land holding incentives, combined with provisions for increased governmental control over the timing, direction, and the rate and level of exploration, development and production activities. They will also provide increased benefits for, and participation by Canadian firms, including Petro-Canada, engaged in development of Canada's resources. In addition, the Statement provides for the introduction of a Progressive Incremental Royalty system, supplementary to basic royalties on production, in order to ensure a fair economic return to the Canadian people from resource development. The legislation not only continues the accepted principle of minimizing front-end loading charges but also the concept of unitary development whereby the industry is assured of rights to produce all hydrocarbon reserves within its development areas.



Drilling seismic holes in the Arctic Islands

The impact of the new legislation on existing permits and leases will be mainly to achieve an acceleration in the pace of exploratory activity. Some of its other features are:

- increased work obligations;
- shorter confidential periods for reports of exploratory projects;
- increased Ministerial authority
  - to order the drilling of wells and commencement of production;
  - to determine product prices;
  - to require submission of contracts and agreements respecting transfers and interests in oil and gas rights as well as supply transfers;
  - to establish levels of minimum Canadian participation in resource ownership;
  - to provide preferences for Petro-Canada in the acquisition of Crown Reserves and certain existing contracts.



### **Canadian Oil and Gas Land Regulations**

The terms for permits already issued under the existing Canada Oil and Gas Regulations are summarized in Figures 4 and 5. Figure 4 shows the permit term in years, including the renewals granted subsequent to the initial term and the total per-acre minimum work requirements to be met during the permit life. The minimum deposit and work requirements for each period of the permit life are illustrated in Figure 5. Figure 6 shows diagrammatically the flow of Canada Oil and Gas Rights, under the present Regulations, and through the various disposal channels.

Because of the delay in tabling the proposed *Canada Oil and Gas Act*, the Ministers of Energy, Mines and Resources and of Indian Affairs and Northern Development recommended amendments to the existing Canada Oil and Gas Land Regulations. These amendments were promulgated in July, 1977, and further amended in November. This series of amendments was designed to establish some of the principles contained in the Policy Statement of May, 1976, principles which are also contained in the proposed legislation. Some of the significant elements of the revised Regulations include replacing the oil and gas permit with an exploration agreement as a vehicle for future disposals of oil and gas rights, issuance of oil and gas leases or continuation by special renewal permit at the option of lease applicants, negotiating continuation of expiring permits under special renewal permit, and establishing the right of Petro-Canada to acquire Crown reserves and to participate in certain existing exploratory permits. Also included is a method of determining the actual beneficial ownership of certain oil and gas rights by Canadians.

At year end, most of the leases for which applications had been received had been issued. Several exploratory agreements had also been negotiated with Petro-Canada, and a survey to determine the extent of Canadian participation in several operating corporations was underway. The anticipated enactment of the proposed legislation and its complementary regulations will completely replace the present Canada Oil and Gas Land Regulations.

### **Canada Oil and Gas Geophysical Regulations**

A joint project was initiated by the Department of Indian and Northern Affairs (DINA) and Energy, Mines and Resources (EMR) to draft the Canada Oil and Gas Geophysical Regulations for promulgation under the *Canada Oil and Gas Production and Conservation Act*. Sections of the regulations will pertain to onshore and offshore geophysical operations on Canada Lands.

The primary intent of these regulations will be to ensure:

- the safety of personnel working on geophysical crews;
- the production of the living resources of the onshore and marine areas to be surveyed;
- the quality and type of the living resources of the onshore and marine areas to be surveyed;
- the quality and type of geophysical data submitted to the relevant resource organizations.

In 1978 the Legal Division of DINA was preparing the draft submission.

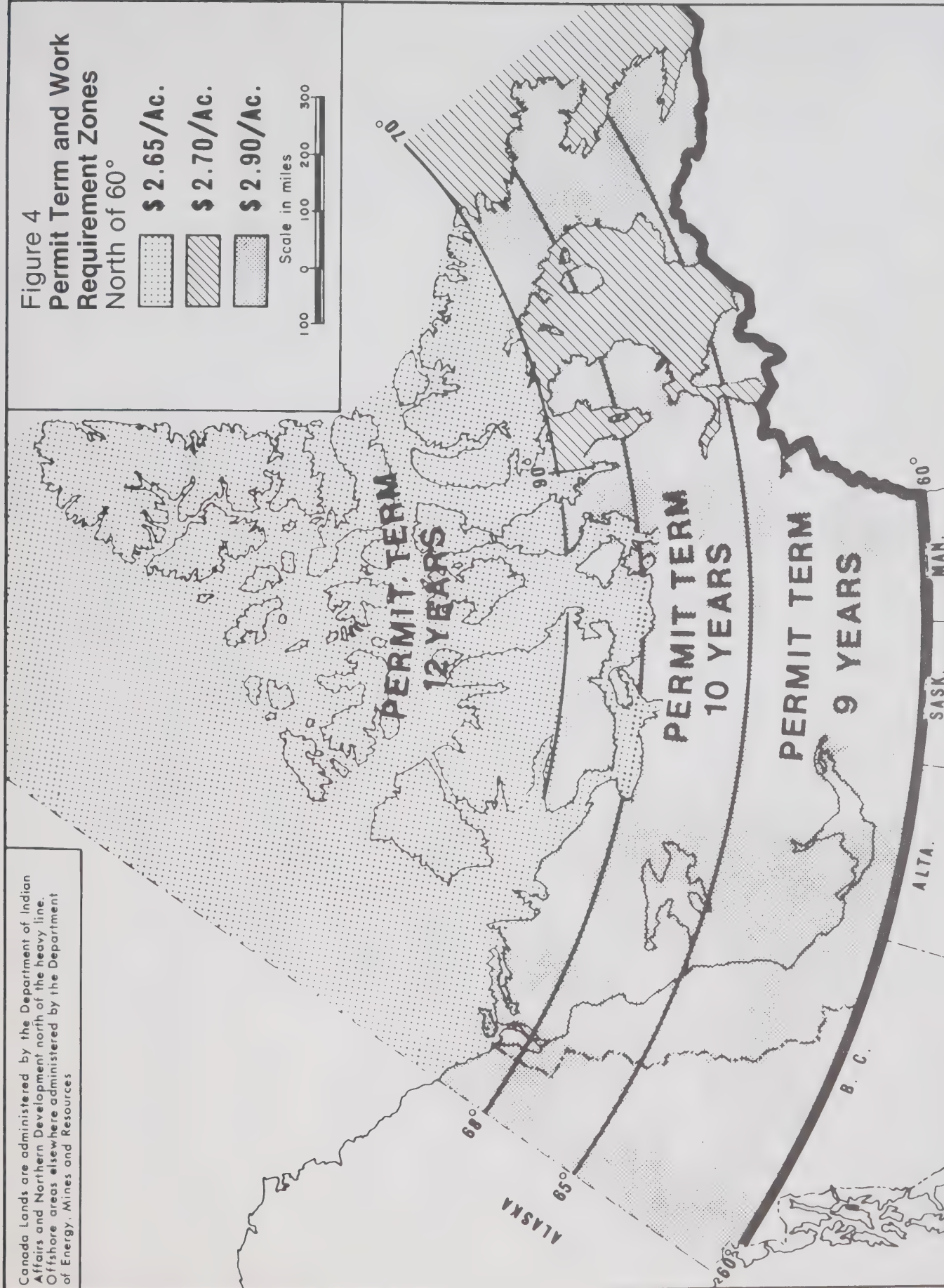
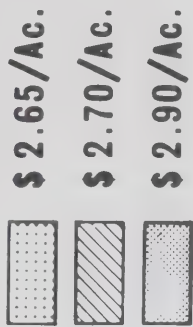
### **Canada Oil and Gas Drilling Regulations**

A joint Project was initiated by DINA and EMR to draft the Canada Oil and Gas Drilling Regulations under the *Canada Oil and Gas Production and Conservation Act*. In 1978 the Regulations pertaining to the drilling of both onshore and offshore wells were completed and reviewed with Industry.

The Regulations were promulgated on January 18, 1979.

Canada Lands are administered by the Department of Indian Affairs and Northern Development north of the heavy line. Offshore areas elsewhere administered by the Department of Energy, Mines and Resources

Figure 4  
Permit Term and Work Requirement Zones  
North of 60°



**Figure 5**  
**Permit Terms and Deposit Requirements—Per Acre**  
**Yukon Territory and Northwest Territories**

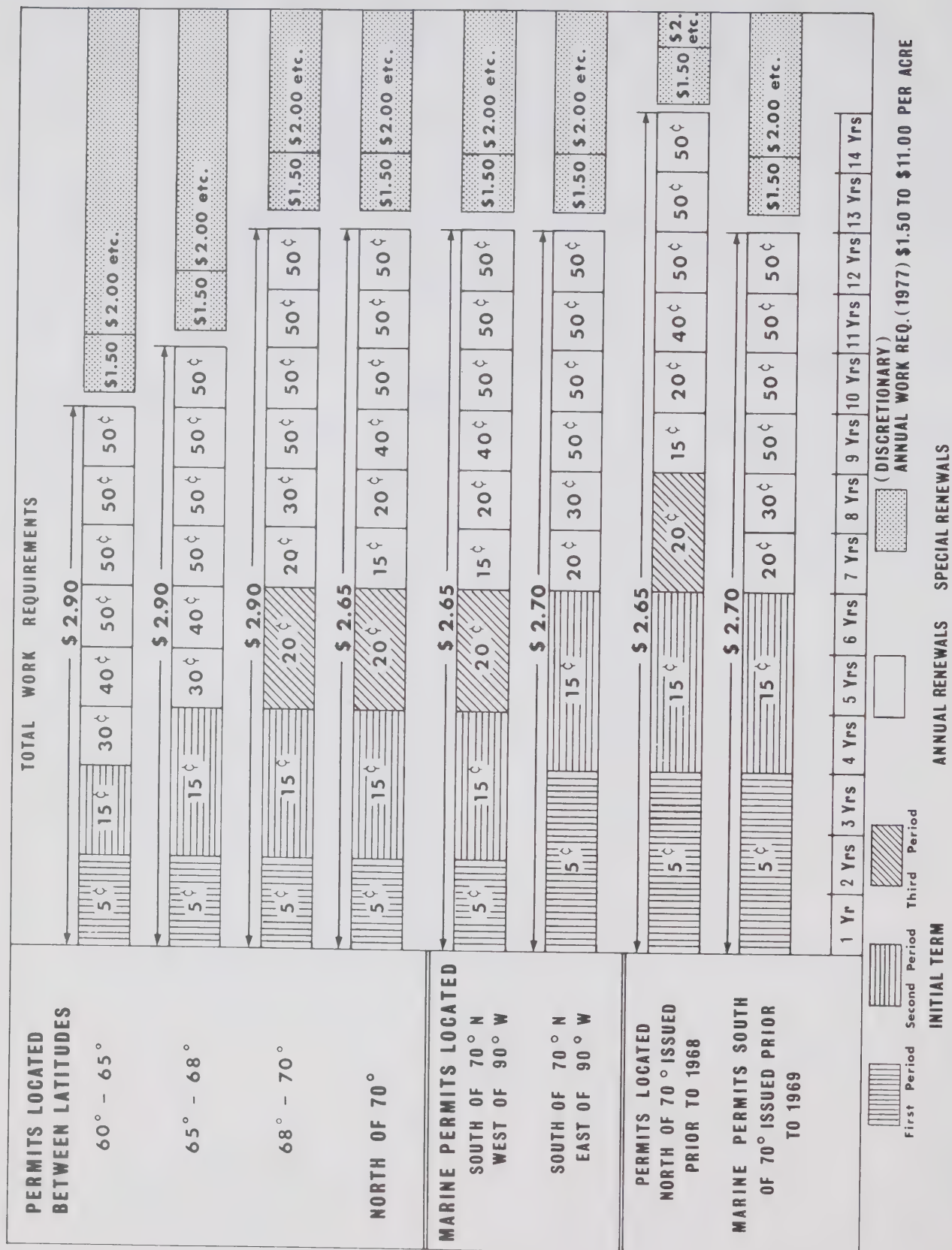
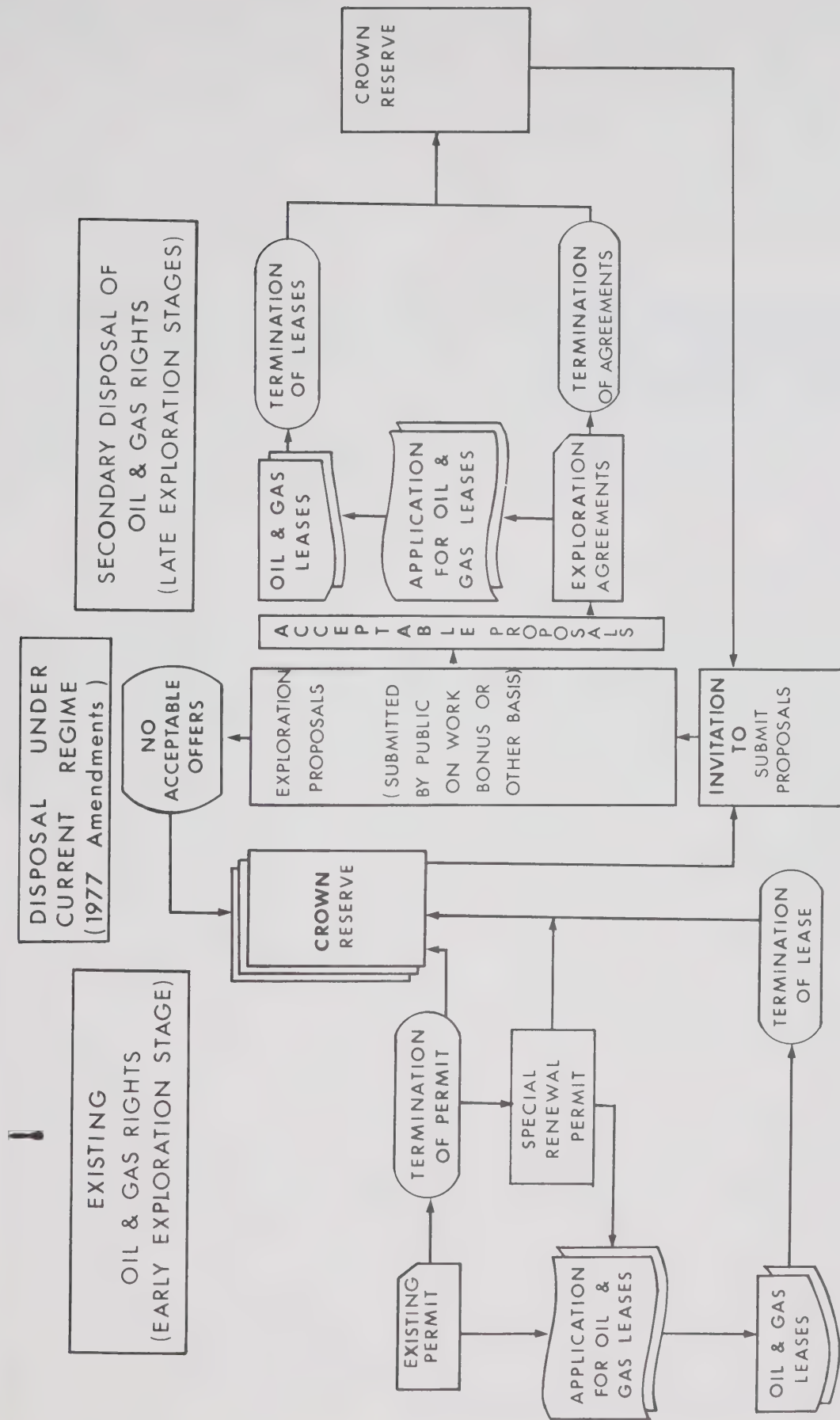




Figure 6  
Flow Diagram of Disposal of Oil and Gas Rights



### **Canada Oil and Gas Production Regulations**

The joint DINA/EMR draft Production and Pipeline Regulations, completed in 1975, were sent to Industry for review and comments in 1976. Joint meetings were held in the first and second quarters of 1977. Consensus has been reached on all but a few items and a final review will be made in June 1978. Legal review commenced in the fourth quarter of 1978.

### **Land Use Regulations**

In June, 1970, amendments to the Territorial Lands Act permitting the implementation of Territorial Land Use Regulations were passed by Parliament.

These Regulations were promulgated on November 4, 1971. They provide authority for designating Land Management Zones in the Yukon Territory and Northwest Territories. Within these zones most major land use operations, including resource exploration and development, require Land Use Permits. These stipulate the measures to be followed by the operator to protect the environment. Permit conditions are established on the recommendation of an interdepartmental and inter-government Land Use Advisory Committee, following consultations with any northern community whose interests may be affected.

As a result of amendments to the Land Use Regulations, a new land-management zone was established effective November, 1975 in order that the Land Use Permit system should apply through the Northwest Territories.

Further revised Land Use Regulations were submitted for the Minister's approval at the end of 1976. The amended Regulations will apply to both large and small land use operations to ensure that every operation which could create a significant environmental impact is controlled by permit.

Equally important, sufficient time is provided to northern communities to comment fully on applications for permits which might affect their interest.

In the Northwest Territories, the Land Use Regulations are administered by the Regional Directorate, Northern Natural Resources and Environment Branch in Yellowknife, and in the Yukon Territory by the Regional Directorate of Northern Natural Resources and Environment Branch in Whitehorse.

### **Metrication in the Oil and Gas Industry**

The Federal Government has announced its intention to introduce omnibus bills in each of the next two years to facilitate Canadian conversion to SI (Système International) measurements. The Oil and Gas Industry (in conjunction with the provincial and federal governments) put forward its plan for the metrication of all aspects of its work and this was approved by the Metric Commission on December 8, 1976. As of January 1, 1979, all transactions of the Industry at all levels – operational, business and governmental – will be required to be expressed in SI units.

Much of the operational work, drilling and construction for example, can already be easily converted but difficulties and confusion could result in dealing with business and government departments. To make personnel throughout the whole Industry thoroughly familiar with the Metric System and competent in its use, the Metrication Training Program, begun in 1976, will continue through 1979. This program, requested and financed by the Canadian Petroleum Industry, is entitled: Metrication and SI units for the Oil and Gas Industry: a learning program for scientific and technical professionals. It consists of books and audio tapes suitable for use by either individuals or groups.

### **Offshore Structures Regulations**

A further joint project was undertaken by DINA and EMR to draft the Canada Oil and Gas Offshore Structures Regulations for promulgation under the *Canada Oil and Gas Production and Conservation Act*. Sections of the Regulations were being prepared for submission to Industry for comments.

# Revenues

While no sales of oil and gas rights were held in 1978, revenues from northern operations during the calendar year approximated \$9.0 million (Table 5 and Figure 7), up \$0.6 million from 1977.

Total revenues from all sources for the fiscal year 1978-79 approximated \$10 million (Table 6 and Figure 8), up \$1.86 million from 1977-78, due mainly to the increase in land rentals.

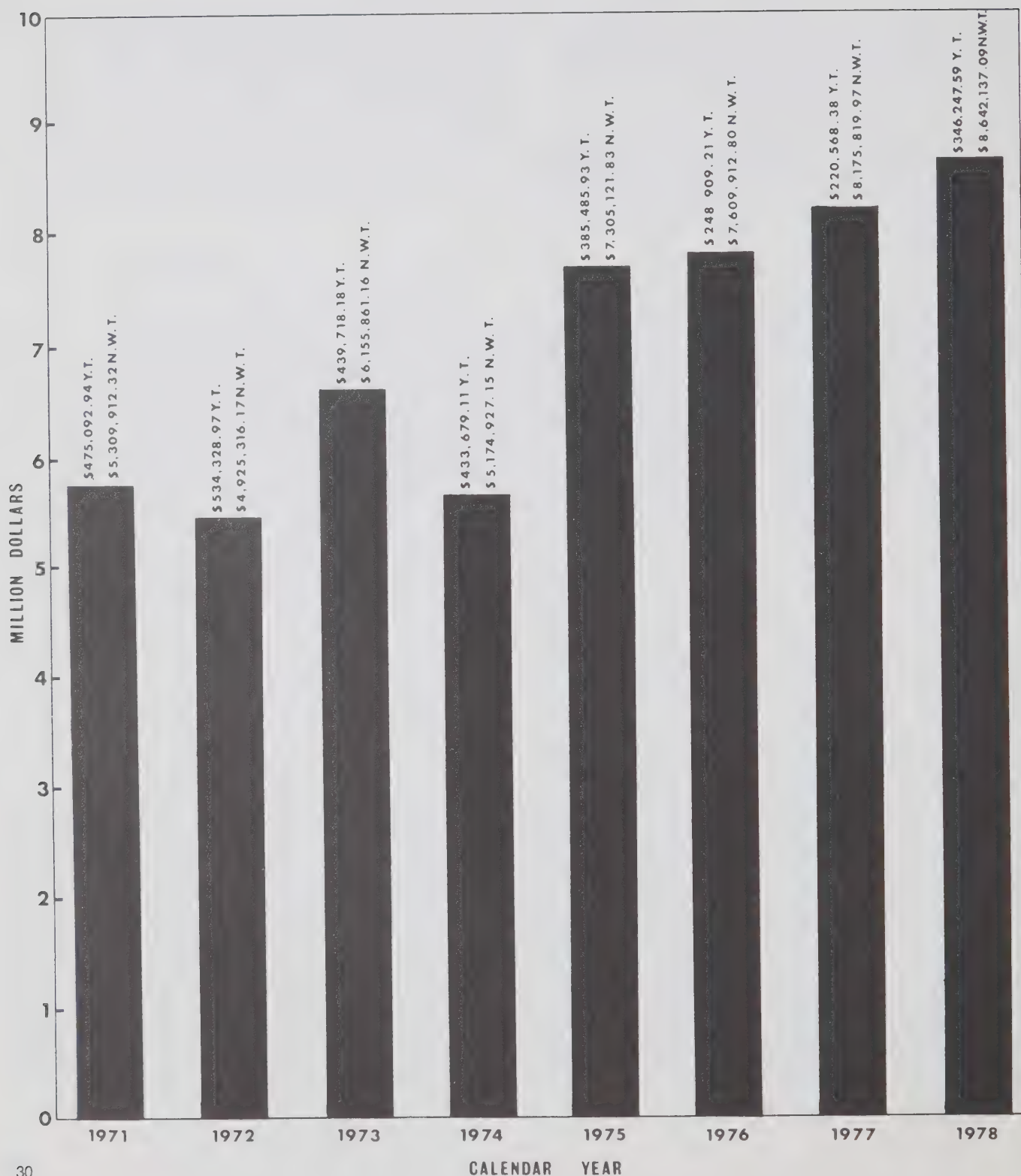
Figure 9 shows the annual value of work bonus for oil and gas work bonus blocks and permits. The cumulative value of work bonus to the end of 1969 was approximately \$59 million. No sales have been made since then.



Drilling Taglu C-42 well on Richards Island



Figure 7  
**Gross Revenue - Oil and Gas  
 from Fees, Forfeitures, Royalties,  
 Rentals and Sale of Maps**  
 Calendar Year  
 Yukon Territory and Northwest Territories



**Table 5 — Gross Revenue, Oil and Gas (Calendar Year) 1972 to 1978**

**Northwest Territories**

Fiscal Year	Licence Fee	Permit Fee	Transfer Fee	Lease Fee	Rentals	Royalties	Forfeitures	Cash Bonus	Misc.	Total
1972	\$ 4 525.00	\$231 500.00	\$ 37 795.00	\$ 3 150.00	\$ 4 135 291.41(1)	\$ 259 276.21	\$ 251 701.28	-	\$ 1 077.27	\$ 4 925 316.17
1973	4 100.00	183 500.00	30 235.00	1 950.00	4 836 714.92(2)	734 962.91	359 957.30	-	4 441.03	6 155 861.16
1974	3 625.00	73 220.00	44 900.00	4 140.00	3 812 555.16(3)	1 186 071.90	47 550.09	-	2 865.00	5 174 927.15
1975	2 750.00	4 000.00	10 005.00	3 970.00	3 684 559.54(4)	3 425 965.83(5)	172 517.93	-	1 353.53	7 305 121.83
1976	2 425.00	-	14 635.00	4 670.00	2 675 065.79(6)	4 688 996.80	219 104.46	-	5 015.75	7 609 912.80
1977	2 600.00	-	12 635.00	6 320.00	3 266 775.28	4 778 130.10	105 853.49	-	3 506.10	8 175 819.97
1978	2 100.00	-	25 550.00	2 600.00	3 999 061.10	4 337 465.61	270 561.83	-	4 798.55	8 642 137.09
Total	\$22 125.00	\$492 220.00	\$175 755.00	\$26 800.00	\$26 411 023.20	\$19 410 869.36	\$1 427 246.38	-	\$23 057.23	\$47 989 096.17

**Yukon Territory**

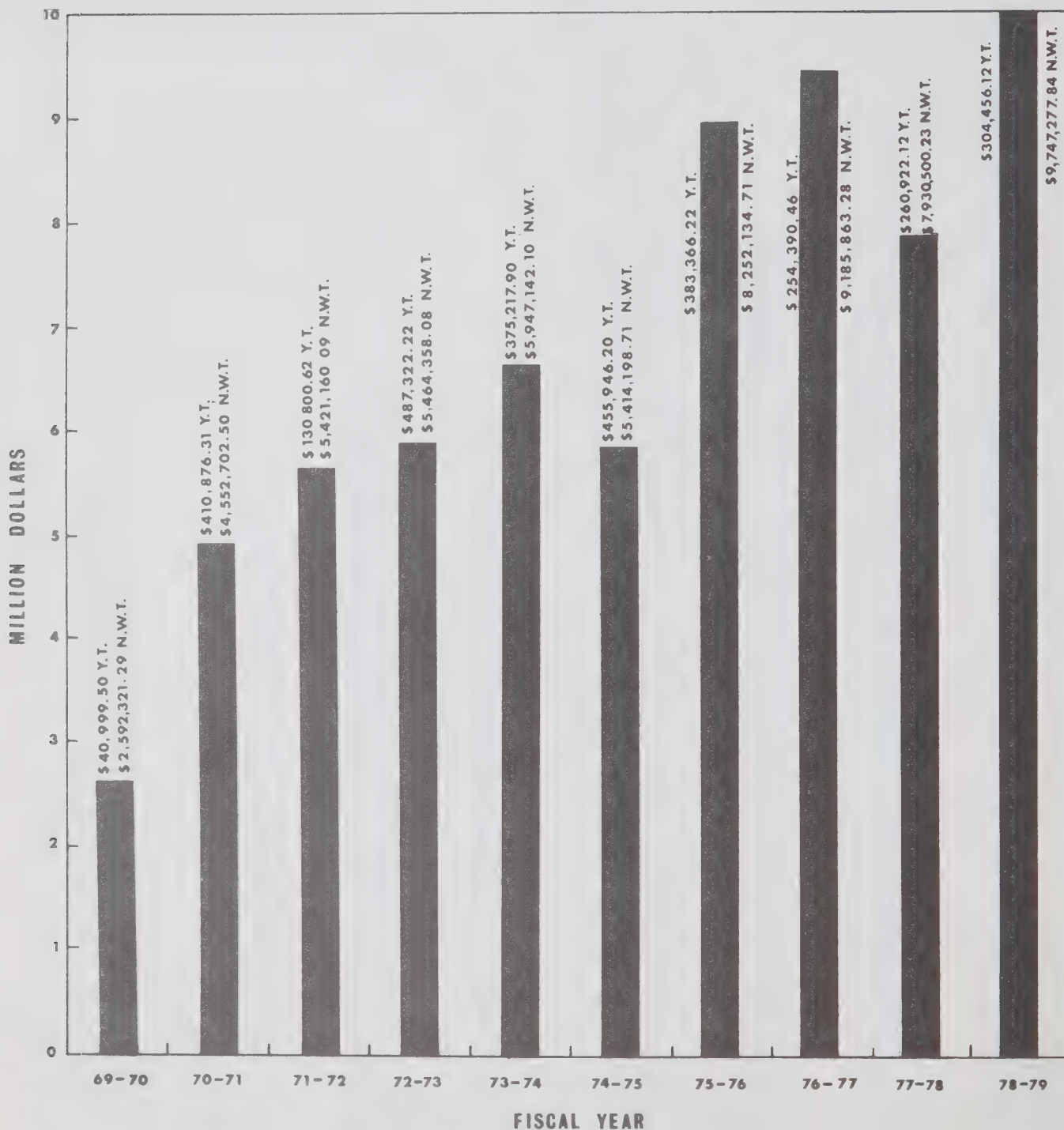
1972	-	750.00	75.00	2 950.00	507 079.00	23 494.97	-	-	-	\$ 534 328.97
1973	-	3 500.00	-	-	417 142.38	19 075.80	-	-	-	439 719.18
1974	-	-	75.00	180.00	409 060.00	24 364.11	-	-	-	433 679.11
1975	-	-	3 610.00	90.00	204 281.25	177 504.68	-	-	-	385 485.93
1976	-	-	45.00	50.00	104 353.00	144 461.20	-	-	-	248 909.21
1977	-	-	1 075.00	110.00	155 065.25	64 318.13	-	-	-	220 568.38
1978	-	-	290.00	320.00	337 081.90	6 710.07	1 845.62	-	-	346 247.59
Total	-	\$ 4 250.00	\$ 5 170.00	\$ 3 700.00	\$ 2 134 062.78	\$ 459 908.97	\$ 1 845.62	-	-	\$ 2 608 937.37

**Total Revenues 1972 to 1978**

1972	
1973	\$ 5 459 645.14
1974	6 595 579.34
1975	5 608 606.26
1976	7 690 607.76
1977	7 858 822.01
1978	8 396 388.35
Total	8 988 384.68
	\$50 598 033.55

- (1) Permit Rental - Special Renewals (\$1 002 534.75)
- (2) Permit Rental - Special Renewals (\$1 444 172.50)
- (3) Permit Rental - Special Renewals (\$ 34 574.00)
- (4) Permit Rental - Special Renewals (\$ 4 617.50)
- (5) Bonus Royalties from Sept. 1972 to Dec. 1975 (\$445 831.42)
- (6) Refund of Previous Years' Rental - Lease Application Withdrawn (\$966 422.50)

Figure 8  
**Gross Revenue - Oil and Gas**  
**from Cash Bonus Bids, Fees, Forfeitures,**  
**Royalties, Rentals and Sale of Maps**  
**Fiscal Year**  
**Yukon Territory and Northwest Territories**





**Table 6 – Gross Revenue, Oil and Gas (Fiscal Year)**

**Northwest Territories**

Fiscal Year	Licence Fee	Permit Fee	Transfer Fee	Lease Fee	Rentals	Royalties	Forfeitures	Cash Bonus	Misc.	Total
1971-72	\$ 5 550.00	\$400 000.00	\$ 52 105.00	\$ 1 100.00	\$ 4 182 655.72(1)	\$ 301 562.00	\$ 476 328.66	-	\$ 1 848.71	\$ 5 421 160.09
1972-73	2 550.00	234 500.00	41 965.00	3 200.00	4 493 538.70(2)	303 427.08	384 624.03	-	553.27	5 484 358.08
1973-74	4 100.00	189 500.00	19 440.00	2 170.00	4 808 931.18(3)	729 372.07	188 606.71	-	5 022.14	5 947 142.10
1974-75	3 125.00	31 220.00	41 680.00	4 810.00	3 899 447.35(4)	1 283 911.85	147 713.98	-	2 290.53	5 414 198.71
1975-76	1 320.00	-	8 955.00	4 040.00	3 718 493.34(5)	4 352 171.61(6)	165 716.01	-	1 438.75	8 252 134.71
1976-77	3 450.00	-	14 870.00	3 960.00	4 343 465.73(8)	4 672 663.83	142 315.07	-	5 138.65	9 185 863.28
1977-78	825.00	-	15 670.00	6 490.00	3 488 769.99	4 624 080.06	105 853.49	-	2 811.20	8 244 499.74
1978-79	1 125.00	-	25 620.00	2 730.00	5 196 829.46(10)	4 231 446.53	285 579.70	-	3 947.15	9 747 277.84
Total	\$22 045.00	\$855 220.00	\$220 305.00	\$28 510.00	\$34 132 131.47	\$20 498 635.03	\$1 896 737.65	-	\$23 050.40	\$57 676 634.55

**Yukon Territory**

1971-72	-	-	410.00	85.00	120 688.25(7)	9 617.37	-	-	-	\$ 130 800.62
1972-73	-	750.00	-	2 950.00	453 756.50	24 865.72	-	-	-	482 322.22
1973-74	-	3 500.00	-	-	357 644.38	14 073.52	-	-	-	375 217.90
1974-75	-	-	75.00	180.00	400 627.00	55 064.20	-	-	-	455 946.20
1975-76	-	-	3 635.00	90.00	184 243.25	195 397.97	-	-	-	383 366.22
1976-77	-	-	1 095.00	80.00	130 779.75	122 435.71	-	-	-	254 390.46
1977-78	-	-	-	140.00	230 641.15	29 216.00	1 845.62	-	-	261 842.77
1978-79	-	-	230.00	420.00	299 291.90	4 514.52(9)	-	-	-	304 456.42
Total	-	\$ 4 250.00	\$ 5 445.00	\$ 3 945.00	\$ 2 177 672.18	\$ 455 185.01	\$ 1 845.62	-	-	\$2 648 342.81

**Grand Total Revenues**

1971-72	\$ 5 551 960.71
1972-73	5 946 680.30
1973-74	6 322 360.00
1974-75	5 870 144.91
1975-76	8 635 500.93
1976-77	9 440 253.74
1977-78	8 506 342.51
1978-79	10 051 734.26
Total	\$60 324 977.36

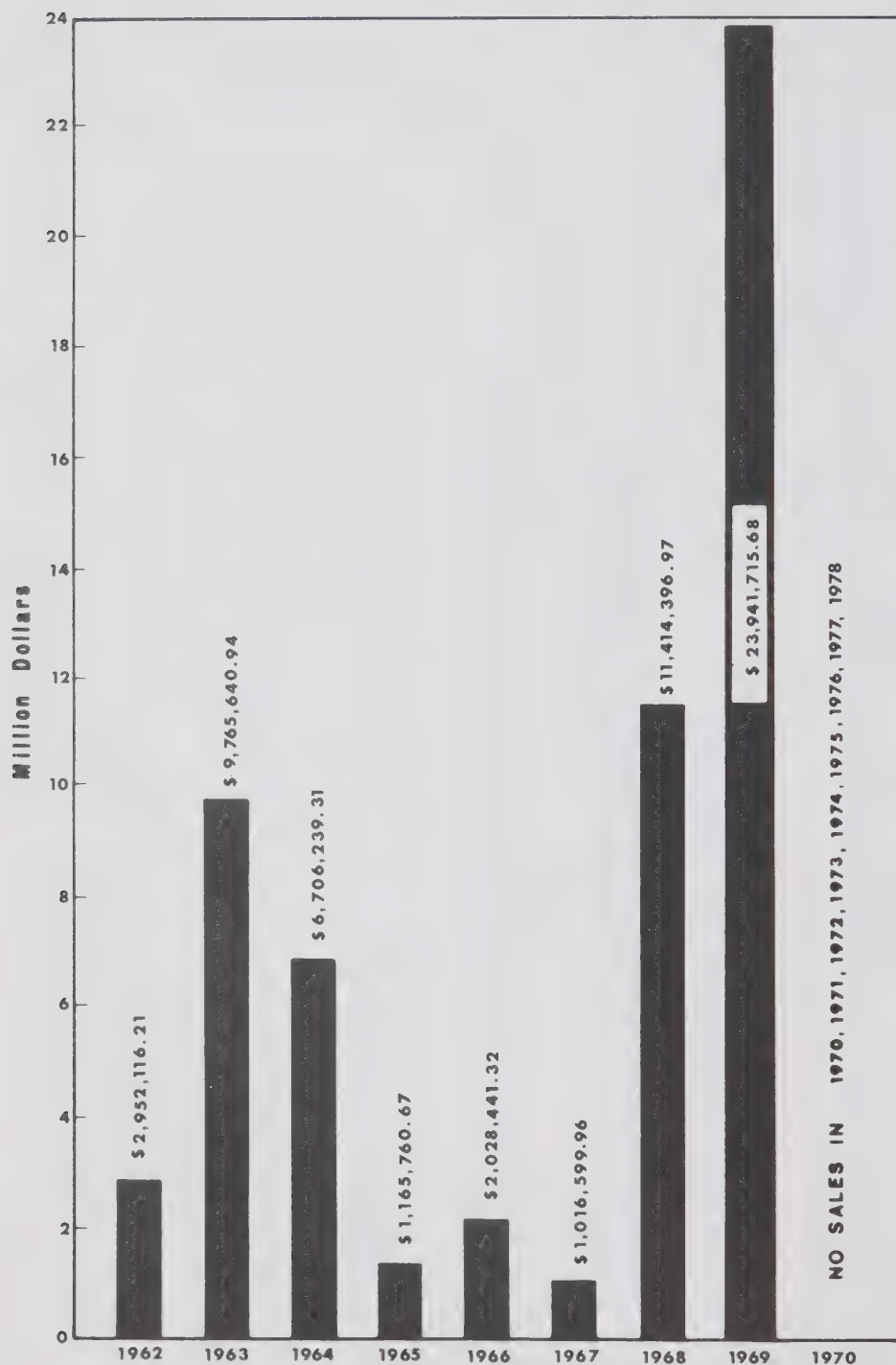
- (1) Permit Renewals (Rental) – Special (\$1 607 455.50)
- (2) Permit Renewals (Rental) – Special (\$1 163 492.75)
- (3) Permit Renewals (Rental) – Special (\$1 283 214.50)
- (4) Permit Renewals (Rental) – Special (\$ 34 574.00)
- (5) Permit Renewals (Rental) – Special (\$ 4 617.50)
- (6) Bonus Royalties from Sept. 1972 to Jan. 1976 (\$ 498 456.45)
- (7) Refunds of Previous Years' Lease Rentals application (\$ 966 425.50)
- (8) Permit Renewals (Rental) – Special (\$ 24 960.00)
- (9) Beaver River Field was Shut-in, November 1978
- (10) Increase of Rental due to issuance of Leases pursuant to 1977 Amendment of Regulation

# Figure 9

## Value of Work Bonus Tenders - Oil and Gas

### Yukon Territory and Northwest Territories

**Note:** Cumulative Value End of December 1969  
\$58,990,911.06



# Exploration, Discoveries and Drilling Operations

## Exploration

### **Geological and Geophysical surveys**

There was very little geological and geophysical work carried out North 60 during 1978 although Petro-Canada did complete four crew months of geological surveys in the Richardson Mountains.

### **Seismic land surveys**

A total of 18 seismic crew months, concentrated in the Arctic Islands, and Mackenzie Delta were reported in 1978 (a decrease of 35 percent from 1977). Detailed seismic work was carried out by Imperial Oil Limited and Petro-Canada Exploration Ltd., in the Mackenzie Delta. In the Arctic Islands, major seismic programs were continued by Panarctic Oils Ltd., on ice in the inter-island areas on behalf of the Arctic Islands Exploration Group. The surveys covered a distance of 2,026 miles (3 260 km), a decrease from the four previous years (see Table 7 and Figs. 10 and 11).

### **Seismic marine surveys**

Marine seismic surveys were carried out by Dome Petroleum Ltd., Imperial Oil Limited and Canadian Superior in the Beaufort Sea, by Petro-Canada in the Baffin Bay-Davis Strait areas. No marine seismic surveys were made in the Arctic Islands in 1978. Participation-type Marine Seismic surveys were carried out by Geophysical Service Inc. in the Beaufort Sea. Attempts to carry out marine surveys in the Davis Strait area were deterred by severe ice conditions. A total of 7,958 miles (12 043 km) were covered in 1978 - a slight increase from 1977.

### **Discoveries**

During 1978 three major gas discoveries were made in the Beaufort Sea and two oil shows were recorded in the same area.



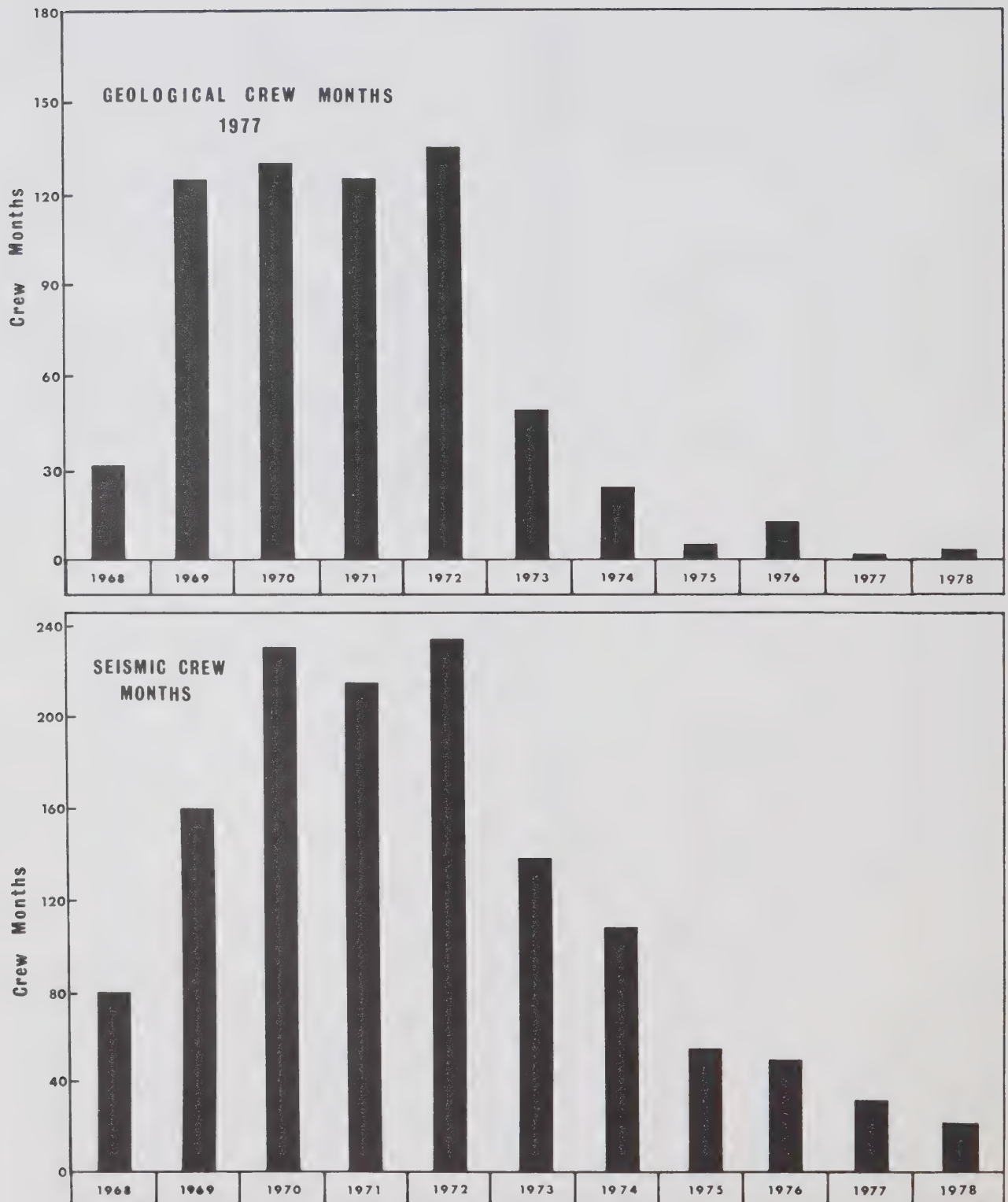
*GSI Mariner*, seismic ship in Beaufort Sea

The gas discoveries were made at Dome Gulf et al Ukalerk C-50 and Hunt Dome Kopanoar M-13 in the Beaufort Sea, by Imperial Oil at Imp. Isserk E-27, by Sun at Garry G-07 in the Mackenzie Delta, and at Columbia Gas et al Kotaneelee, Y.T. E-37 in the Liard Plateau of the southern Yukon Territory.

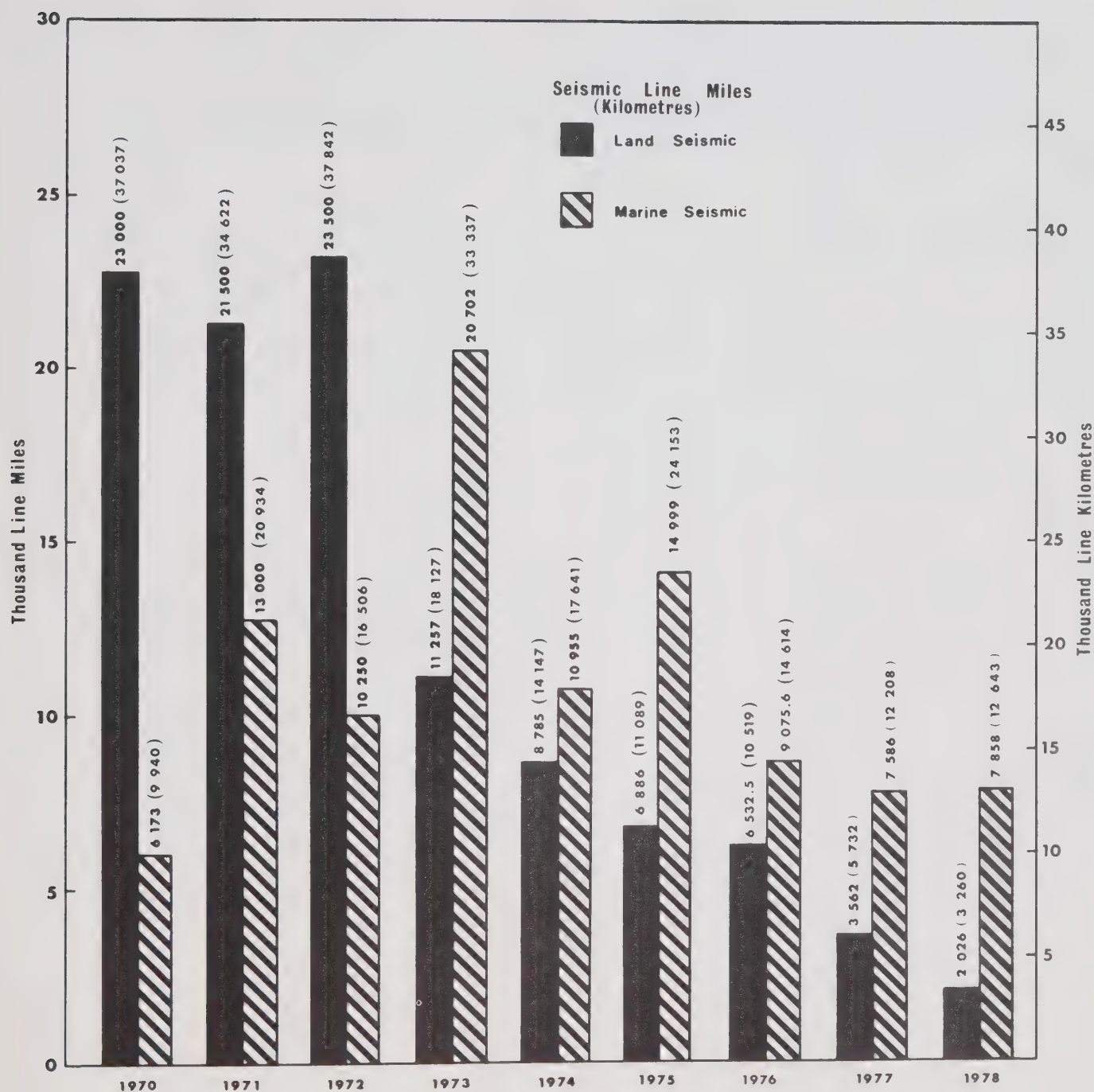
In the Arctic Islands, Panarctic Oils Ltd. drilled an extension to the Drake Gas Field at Drake F-76.



Figure 10  
**Exploration Activity**  
 Yukon Territory and Northwest Territories



**Figure 11**  
**Exploration Activity**  
 Yukon Territory and Northwest Territories



**Table 7 - 1973-1977 Exploration Survey Statistics**

	Yukon Territory	N.W.T. Mainland	Mackenzie Delta	Beaufort Sea	Arctic Islands and Surrounding Water	Baffin Bay - Davis Strait	Total
<i>Geological</i>							
<i>Crew Months</i>							
1973	3.0	9.0	0	0	37.0	1.0	50.0
1974	3.5	1.5	4.5	0	15.5	0	25.0
1975	0	0	0	0	3.5	1.0	4.5
1976	4.0	1.5	1	0	5.5	1.0	13.0
1977	0	0	1.5	0	1.0	0	2.5
1978	0	0	3.0	0	1.0	0	4.0
<i>Land Seismic</i>							
<i>Crew Months</i>							
1973	10.0	25.0	42.0	4.0	58.0	0	139.0
1974	3.0	27.0	41.0	2.0	37.0	0	110.0
1975	0	14.5	10.5	0.1	32.0	0	57.1
1976	0	3.0	18.5	1.0	29.5	0	52.0
1977	0	0.5	10.0	0	21.5	0	32.0
1978	0	2.0	8.0	0	7.5	0	17.5
<i>Seismic Line</i>							
<i>Miles</i>							
<i>(Kilometres)</i>							
<i>Land</i>							
1973	611(984)	1 152(1 855)	3 473(5 593)	470(757)	5 551(8 939)	0	11 257(18 127)
1974	121(195)	1 932(3 111)	3 229(5 200)	75(121)	3 428(5 520)	0	8 785(14 147)
1975	0	1 572(2 531)	679(1 093)	9(14)	4 626(7 449)	0	6 886(11 089)
1976	0	3 375(5 435)	2 082(3 353)	77(124)	4 036(6 499)	0	6 532(10 519)
1977	0	48( 77)	504.5(811.9)	0	3 009.5(4 843.3)	0	3 562(5 732.5)
1978	0	89( 143)	417(671)	0	1 520(2 446)	0	2 026(3 260)
<i>Marine</i>							
1973	0	18(29)	0	4 603(7 412)	5 006(8 061)	11 075(17 834)	20 702(33 337)
1974	0	0	0	1 724(2 776)	4 159(6 697)	5 072( 8 167)	10 955(17 641)
1975	0	0	0	2 568(4 135)	3 341(5 380)	9 090(14 638)	14 999(24 153)
1976	0	0	42.6(69)	2 804(4 515)	1 336(2 151)	4 893( 7 879)	9 075.6(14 614)
1977	0	0	0	2 901(4 668.7)	2 119(3 410.2)	2 566( 4 129.6)	7 586(12 208.5)
1978	0	0	0	3 572(5 747)	0	4 286(6 896)	7 858(12 643)



## **Drilling**

(See Table 8 and Figures 12 to 16 inclusive)

Drilling activities continued to decline in 1978. Nineteen wells, with a total footage of 180,576 feet were drilled, of which 15 were exploratory and four development wells.

**1. Arctic Islands:** Panarctic Oils Ltd. successfully achieved the first subsea completion in the Arctic at their gas well Panarctic Drake F-76. The gas was moved from the offshore location through a flowline to shore on the north-east coast of Melville Island. This development gives encouragement to the feasibility of exploiting offshore Arctic gas reserves. Means for their subsequent transportation to market are under consideration (see the section entitled **Pipelines**).

**2. Beaufort Sea:** Using experience gained since 1976 and with the improved drilling procedures developed to deal with the hazardous Beaufort Sea conditions, Dome/Canmar and its fleet – including the three drillships – had its best season to date. Kopanoar M-13 suspended last year at 8,434 feet was deepened to 14,174 feet. Ukalerk 2C-50 was drilled to 16,250 feet. Both wells having encountered gas shows will be tested early in the 1979 season. Three wells were suspended for further drilling; these include Natsek E-56 (8,840 feet), Nerlerk M-98 (1,800 feet) and Tarsuit A-25 (1,426 feet). The Kaglulik A-75 well was abandoned because of mechanical problems.

The drilling season has been extended through the deployment of the icebreaker C.C.G. John A. MacDonald. Dome/Canmar also hopes to use a fourth drillship during the summer of 1979.

**3. Mackenzie Delta:** Imperial Oil Limited completed the first phase of its artificial island at Issungak M-61, located in 60 feet of water just north of the Isserk Island. Present plans call for the completion of construction of the island in the summer of 1979 so as to permit a well to be spudded, in November 1979.

**4. Yukon:** Columbia Gas is nearing completion of the Kotaneelee Gas Field development, including a water injection well, a gas plant and a pipeline.

### **1979 Forecast**

The forecast is for decreased activity in 1979 due in the main, to a slow-down in Arctic gas development. Exploration in the Beaufort Sea will continue at the same pace as will also the initial drilling offshore in Davis Strait in the Eastern Arctic. Imperial Oil Limited (ESSO) is also delineating its oil field at Norman Wells. A total of 20 wells, both offshore and onshore, is expected to be drilled North of 60 during 1979.

**Table 8 —****Wells Abandoned or Completed in 1978**

A total of 19 wells drilled and completed or abandoned is recorded for 1978. The total footage was 180,476 feet. (D & A indicates dry and abandoned).

**Northwest Territories — Arctic Islands**

<i>Name of Well</i>	<i>Spudded</i>	<i>Completed</i>	<i>Status</i>	<i>Total Depth (feet)</i>
H.B. Norcen Phillips Cape Allison L-50 L-50-77-50-105-30	77-11-09	78-03-16	D & A	9 587
Panarctic et al Bent Horn A-57 A-57-76-30-103-30	78-05-23	78-08-29	D & A	11 900
Panarctic et al Beverley Inlet G-13 G-13-75-10-108-00	77-11-19	78-06-23	D & A	13 322
Panarctic et al Drake F-76 F-76-76-30-108-00	78-03-02	78-04-30	Completed gas well	3 702
Panarctic et al Drake Point K-79 K-79-76-30-108-30	78-05-18	78-06-23	D & A	5 660
Panarctic et al Grassy I-34 I-34-76-30-112-00	78-03-03	78-04-18	D & A	3 200
Panarctic et al Richardson Point G-12 G-12-75-50-105-30	77-10-23	78-01-25	D & A	11 010
Panarctic et al Roche Pt. O-43 O-43-76-50-109-30	78-01-18	78-04-18	Aban- doned gas well	9 455
Panarctic et al Stokes Range J-11 J-11-76-30-101-30	78-05-31	78-09-17	D & A	10 957

**Northwest Territories — Mainland**

Esso Norman Wells (36X) B-48 B-48-65-20-126-45	78-10-25	78-12-12	Oil Well	5 584
Gulf PEX et al Arrowhead M-05 M-05-60-30-123-00	78-02-14	78-03-23	D & A	9 117
PEX Fina N Colville L-21 L-21-67-50-126-00	78-01-27	78-03-29	D & A	3 921
Imp. Mallik J-37 J-37-69-30-134-30	77-12-22	78-04-11	D & A	10 160
Sun CCL BVX et al Garry G-07 G-07-69-30-135-30	78-02-10	78-05-13	Completed gas well	13 193

**Northwest Territories — Beaufort Sea**

Dome Gulf et al Ukalerk 2C-50 C-50-70-10-132-30	78-07-10	78-10-16	Suspended	16 250
Hunt Dome Kopanoar M-13 M-13-70-30-135-00	76-10-05	78-10-16	Suspended	14 174
Imp. Isserk E-27 E-27-70-00-134-15	77-12-04	78-05-04	Aban- doned gas well	13 519
Dome Kaglulik A-75 A-75-70-40-130-30	77-07-19	78-08-05	D & A	2 115

**Yukon Territory**

Columbia et al Kotanelee E-37 E-37-60-10-124-00	78-01-21	78-12-05	Gas well	13 750
---	----------	----------	----------	--------

Figure 12

# Wells Completed or Abandoned in 1978

## LEGEND

☼ Gas Well

⊙ Suspended

● Oil Well

⊙ Dry and Abandoned

3 300' Total Depth

Number of Wells Drilled In 1978-19 Footage Drilled In 1978-180,476

0 50 100 miles

0 80.5 161 kilometres

No.

Depth

1 PEX Fina N Colville L-21 3 921'

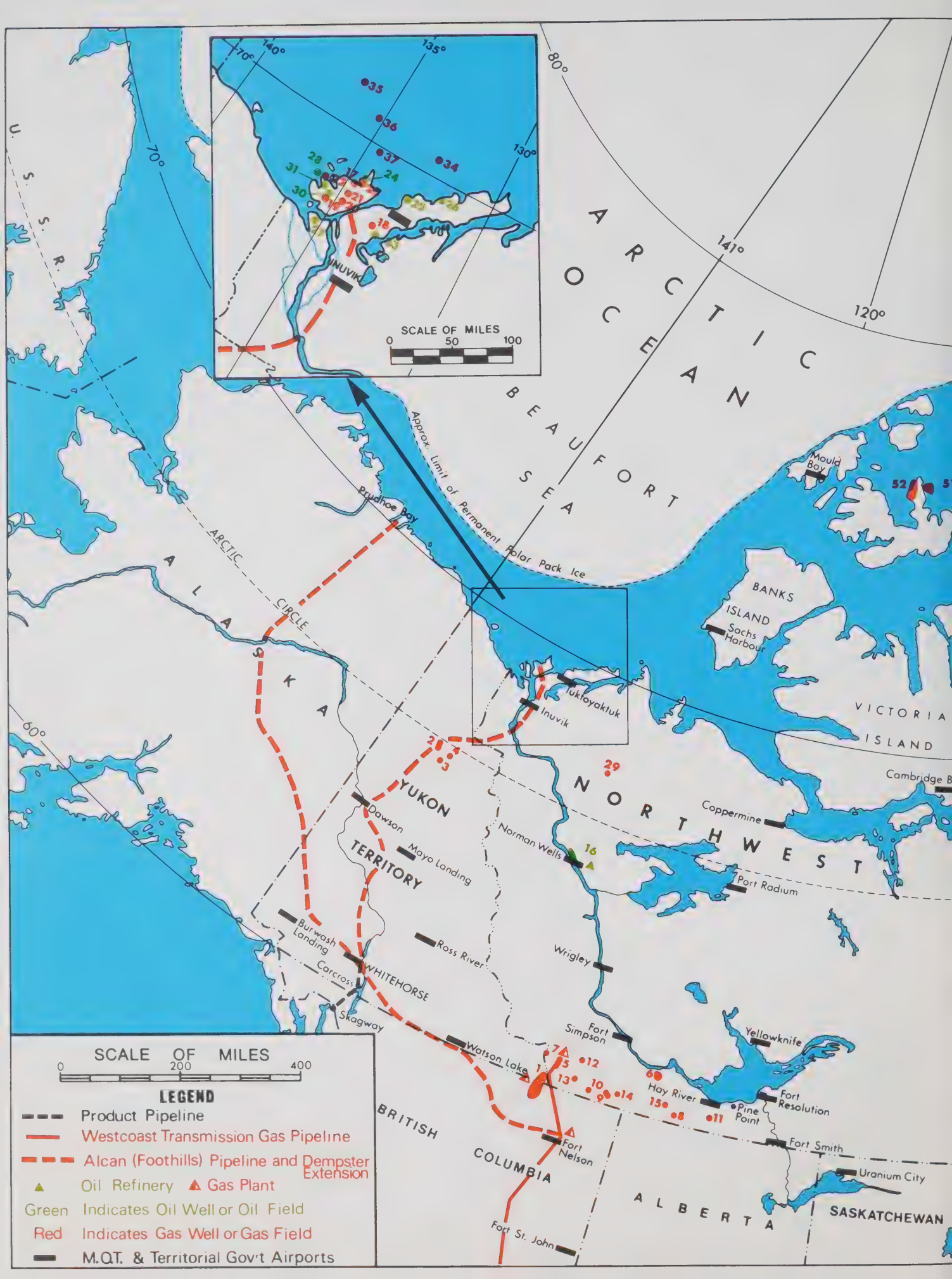
2 Esso Norman Wells (X36) 1 702'

3 Gulf PEX et al Arrowhead M-05 9 117'

4 Columbia et al Kotaneelee E-37 13 750'







This map illustrates the northernmost regions of Canada, including the Northwest Territories, Nunavut, and portions of Greenland and Manitoba. The Arctic Ocean is shown in light blue, while landmasses are in white. Key locations marked include Alert, Eureka, Repulse Bay, Baker Lake, Rankin Inlet, Eskimo Point, Churchill, and Coral Harbour. Major bodies of water like Baffin Bay and Hudson Bay are labeled. The Arctic Circle and the 10th parallel are also indicated.

- 1 Beaver River Gas Field
- 2 Chance Gas Field
- 3 Socony Mobil et al Blackie No. 1
- 4 Socony Mobil et al Birch Y.T. B-34

- 5 Pointed Mountain Gas Field
- 6 Rabbit Lake Gas Field
- 7 C.P.O.G. et al LaBiche F-08
- 8 H.B. Cameron Hill A-05
- 9 S. Indian River Gas Field
- 10 Home Signal Celibeta H-78
- 11 Shell H.B. Grumbler G-63
- 12 Sun Netla C-07
- 13 Texaco Bovie Lake J-72
- 14 Union Pan Am. Trainer Lake C-39
- 15 Pacific Amoco Tathlina N-18
- 16 Normal Wells Oil Field
- 17 Taglu Gas Field
- 18 Parsons Gas Field
- 19 Gulf Imperial Shell Titalik K-26
- 20 Gulf Imperial Shell Reindeer F-36
- 21 Gulf Mobil Ya Ya P-53      A-28 Gas Pools
- 22 Shell Niglintgak H-30      M-19
- 23 Imperial I.O.E. Mallik L-38
- 24 Imperial Ivik J-26
- 25 I.O.E. Mayogiak J-17
- 26 I.O.E. Atkinson H-25
- 27 Shell Kugpik O-13
- 28 Imp. Adgo F-28
- 29 Ashland Tedji Lake F-24
- 30 Kumak Oil and Gas Field
- 31 Garry Oil and Gas Field
- 32 Imp. Netserk F-40
- 33 Gulf Mobil Kamik D-48
- 34 Dome Hunt Nektoralik K-59
- 35 Dome Gulf et al Ukalerk C-50
- 36 Hunt Dome Kopanoar M-13
- 37 Imp. Isserk E-27

- 51 Drake Point Gas Field
- 52 Hecla Gas Field
- 53 King Christian Gas Field
- 54 Panarctic Tenneco et al Kristoffer Bay B-06
- 55 Dome Arctic Ventures Wallis K-62
- 56 Thor Gas Field
- 57 Panarctic Romulus
- 58 Dome Sutherland O-23
- 59 Panarctic Bent Horn N-72, A-02
- 60 Panarctic Jackson Bay G-16A

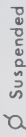
Figure 13

# Wells Completed or Abandoned in 1978

## LEGEND



Gas Well



Suspended



Oil Well



Dry and Abandoned

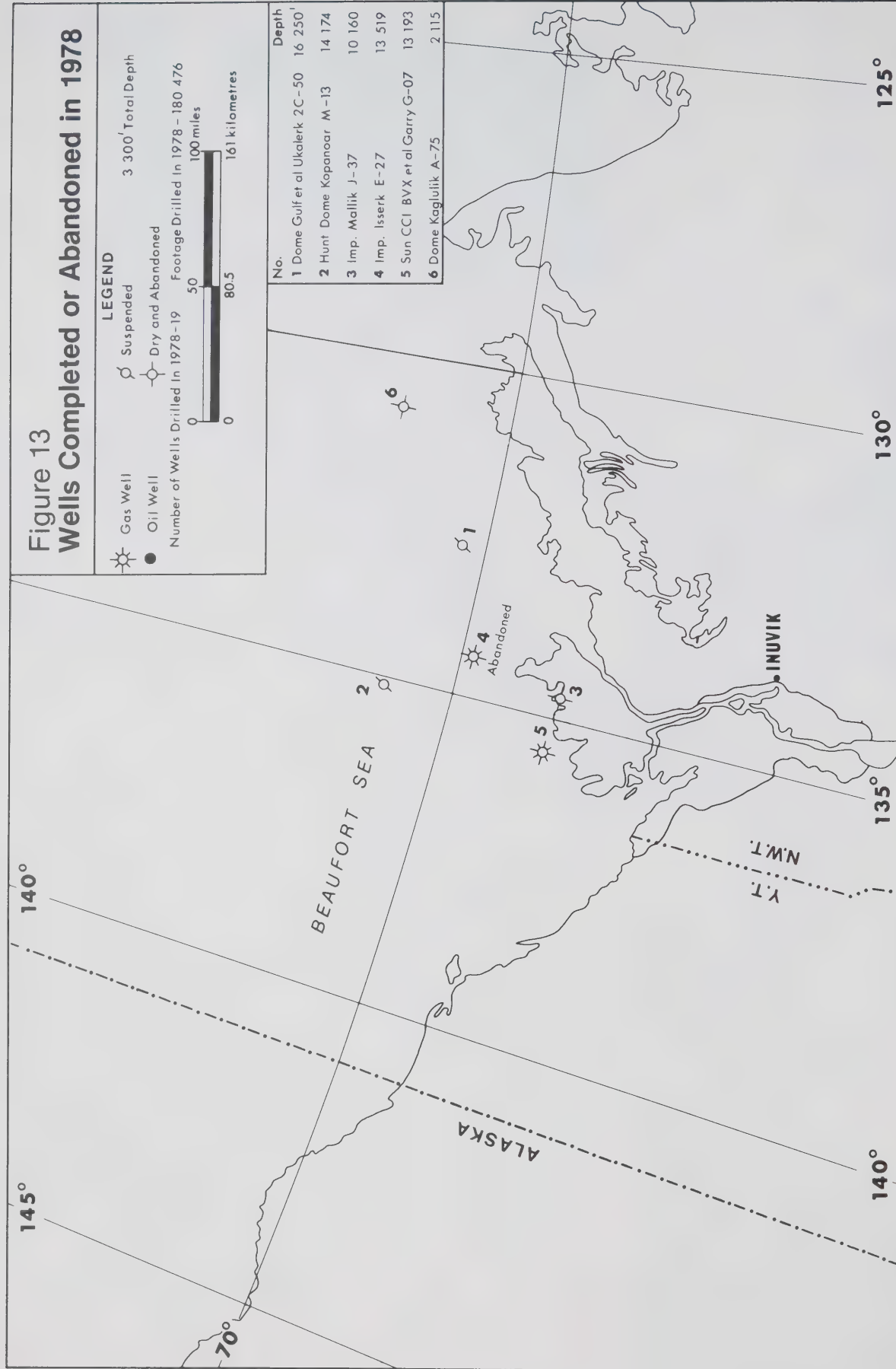
Number of Wells Drilled In 1978-19 Footage Drilled In 1978 - 180 476

0 50 100 miles

0 80.5 161 kilometres

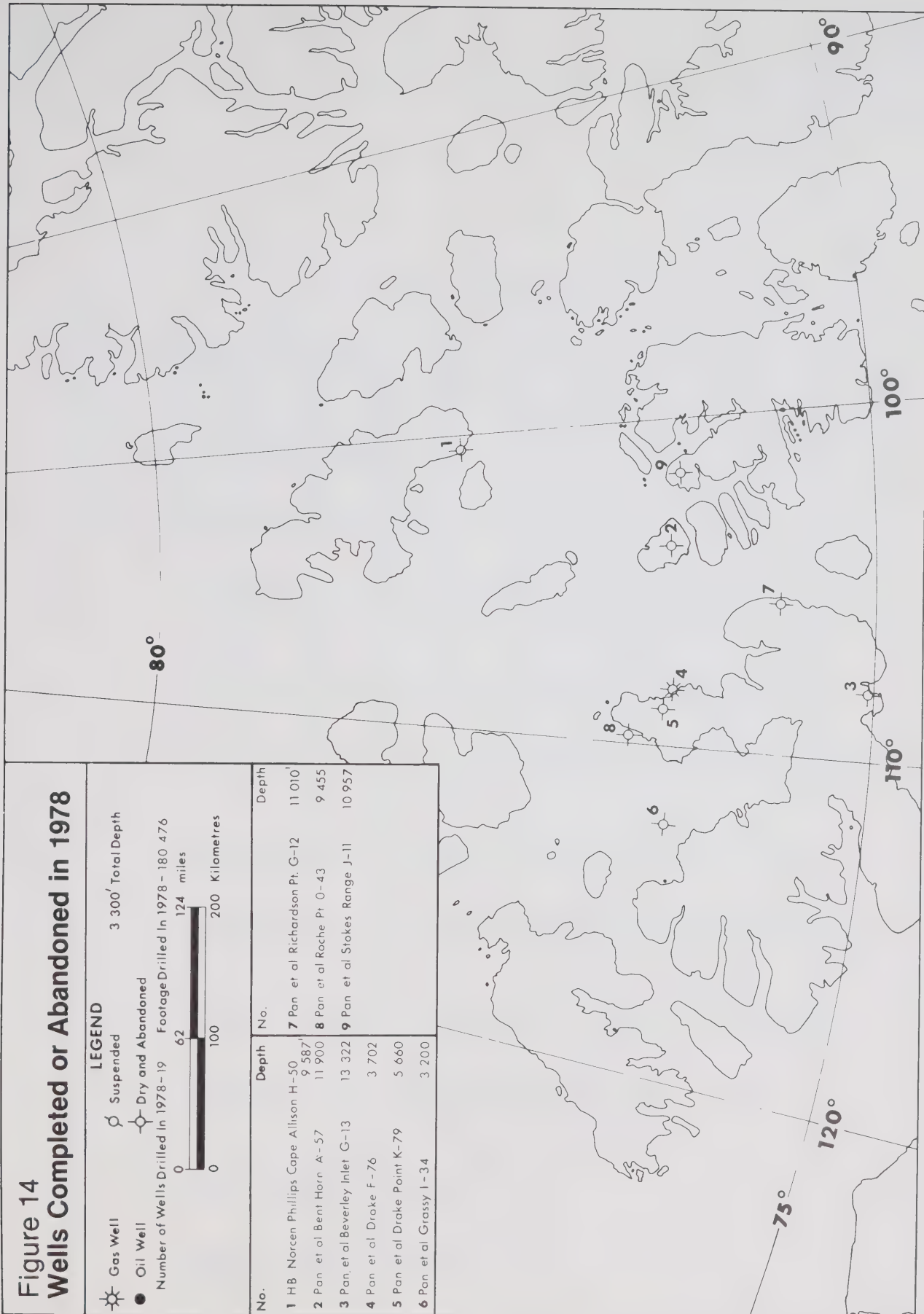
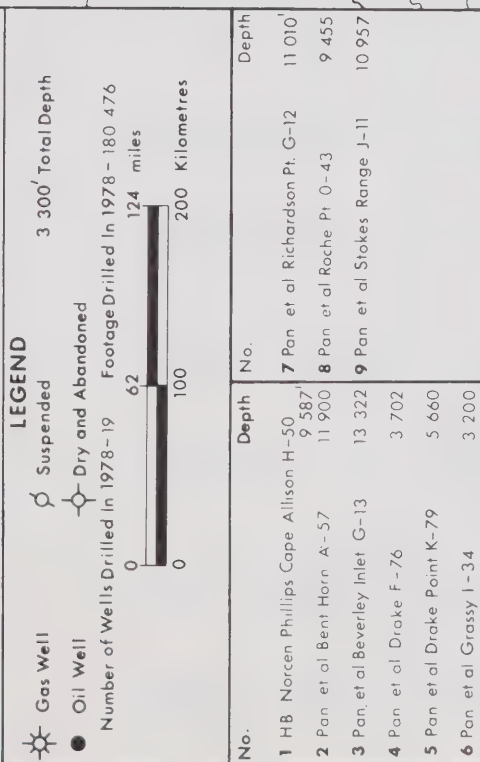
3 300' Total Depth

No.	Depth
1 Dome Gulf et al Ukalerk 2C-50	16 250'
2 Hunt Dome Kopanoar M-13	14 174
3 Imp. Mallik J-37	10 160
4 Imp. Isserk E-27	13 519
5 Sun CCI BVX et al Garry G-07	13 193
6 Dome Kaglulik A-75	2 115





**Figure 14**  
**Wells Completed or Abandoned in 1978**



**Figure 15**  
**Wells Drilled**  
**Yukon Territory and Northwest Territories**  
 Number of Wells Drilled to end 1978 (912)

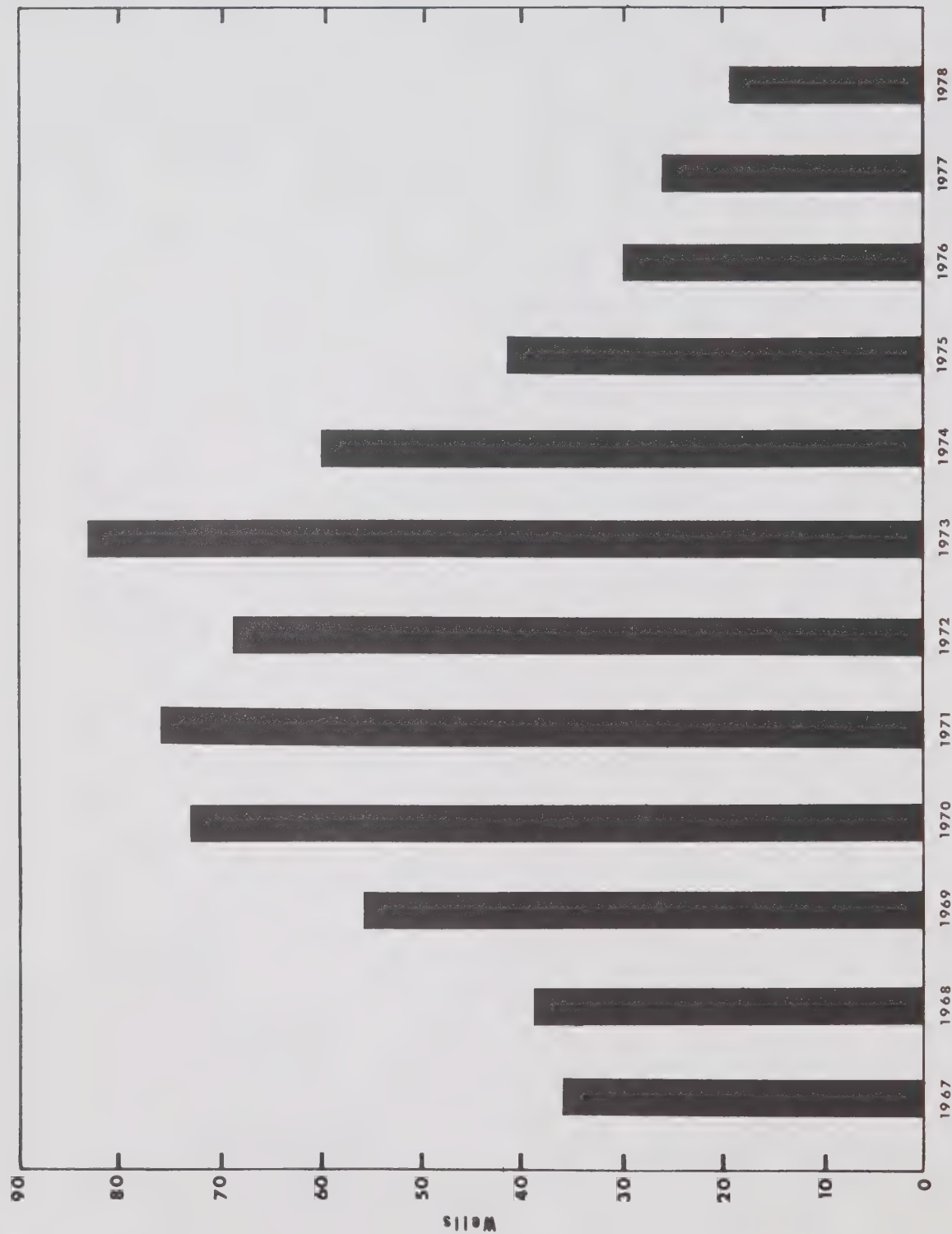


Figure 16  
**Depth Drilled**  
 Yukon Territory and Northwest Territories





# Net Cash Expenditures by Industry in 1978

**Table 9 - Net Cash Expenditures 1977 Final**  
(in thousands of dollars)

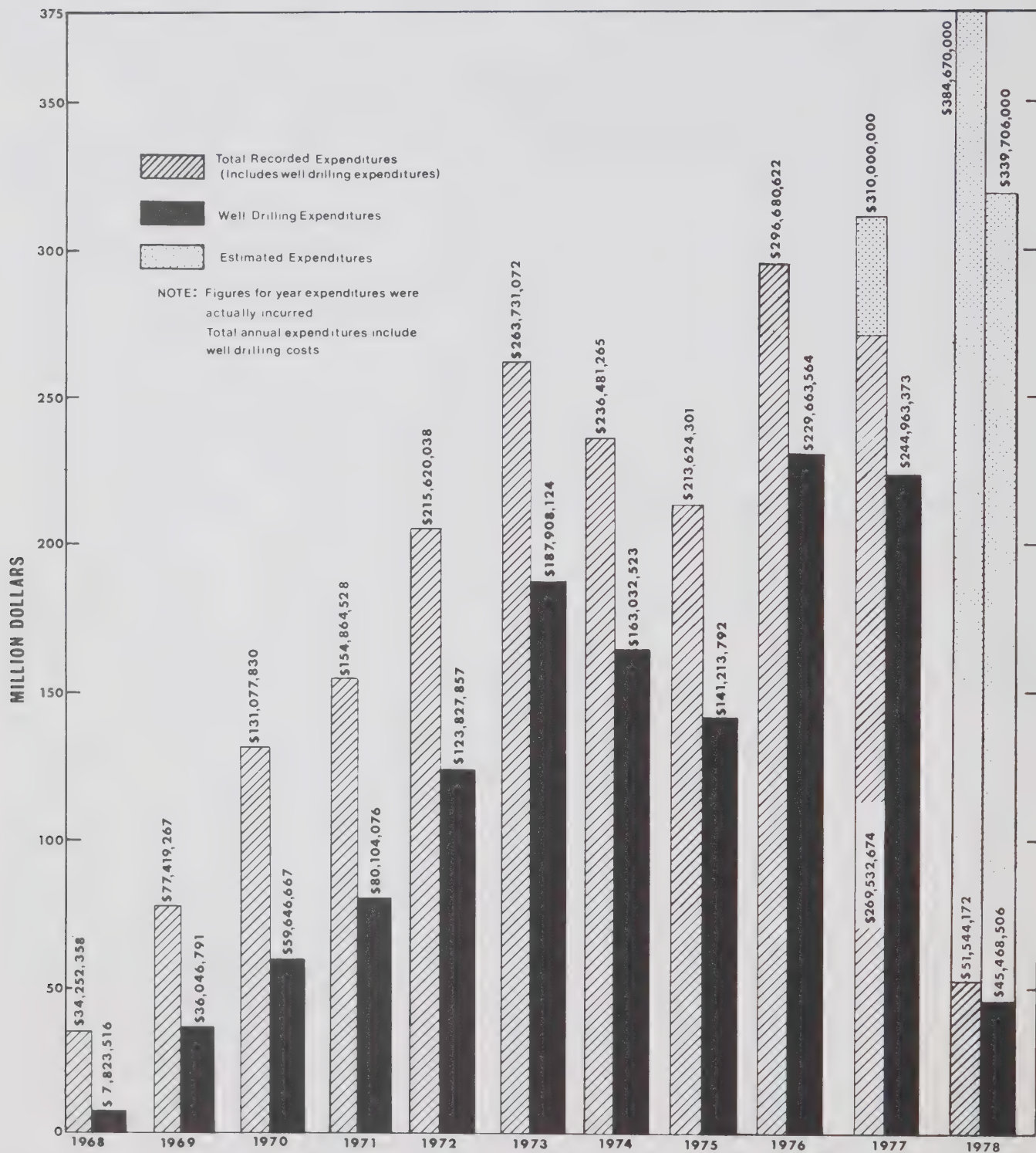
	<i>Off Shore</i>			Yukon N.W.T. and Arctic Islands	Canada
	East Coast	Hudson Bay	West Coast		
<b>Geological and Geophysical Expenditures</b>					
(a) Seismic Crew expenses .....	6 793	-	-	29 315	164 350
(b) All other geological and geophysical expenses .....	10 217	151	-	30 383	192 614
<b>Land and Lease acquisition and retention</b>					
(a) Permit fees and acquisition costs .....	20	-	-	28	735 890
(b) Non-producing acreage retention costs .....	1 611	-	-	3 527	83 985
(c) Producing lease and surface rentals .....	-	-	-	128	40 083
Exploratory drilling .....	23 834	-	-	277 944	784 094
Development drilling .....	-	-	-	7 147	438 881
<b>Other capital expenditures</b>					
(a) Tangible well and lease equipment .....	37	-	-	4 385	282 047
(b) Pipelines and related facilities .....	-	-	-	3 853	56 481
(c) Secondary recovery and pressure maintenance projects .....	-	-	-	-	31 876
(d) Natural gas processing plants .....	-	-	-	2 142	155 505
(e) All other capital expenditures .....	992	-	-	2 471	46 179
Field, well and pipeline operations .....	-	-	-	3 318	574 835
Natural gas plant operations .....	-	-	-	1 476	259 052
<b>Other operating expenditures</b>					
(a) Taxes (excluding income taxes) .....	40	-	-	321	111 857
(b) Royalties .....	-	-	-	4 842	2 673 821
(c) Interest expense .....	1 027	-	-	108	157 409
(d) Other .....	238	-	-	1 351	122 242
<b>Total</b> .....	44 809	151	-	372 739	6 911 201

Total expenditures, according to information compiled by DINA, Statistics Canada and industry are shown in Tables 9 and 10 and Figure 17. Gross industry expenditures North of 60 increased over those of 1977 by approximately \$60 million to reach a total of \$434 million. Exploratory and development drilling expenditures increased to \$339 million (up 19 per cent), while total geological and geophysical expenditures decreased to \$45 million, a twenty per cent decline from 1977. For the 1978 period, expenditures on lands administered by EMR were \$94 million, an increase of \$54 million from the previous year.

**Table 10 - Net Cash Expenditures 1978 Preliminary**  
(in thousands of dollars)

	<i>Off Shore</i>			Yukon N.W.T. and Arctic Islands	Canada
	East Coast	Hudson Bay	West Coast		
<b>Geological and Geophysical Expenditures</b>					
(a) Seismic Crew expenses .....	7 260	-	-	20 600	237 092
(b) All other geological and geophysical expenses .....	11 859	12	-	24 364	260 644
<b>Land and Lease acquisition and retention</b>					
(a) Permit fees and acquisition costs .....	3 265	-	-	25	953 244
(b) Non-producing acreage retention costs .....	159	-	-	4 336	90 283
(c) Producing lease and surface rentals .....	-	-	-	238	34 982
Exploratory drilling .....	68 214	-	-	316 773	1 184 918
Development drilling .....	-	-	-	22 933	609 056
<b>Other capital expenditures</b>					
(a) Tangible well and lease equipment .....	-	-	-	6 121	408 014
(b) Pipelines and related facilities .....	-	-	-	36	67 055
(c) Secondary recovery and pressure maintenance projects .....	-	-	-	106	56 582
(d) Natural gas processing plants .....	-	-	-	5 015	218 830
(e) All other capital expenditures .....	2 009	-	-	21 198	76 211
Field, well and pipeline operations .....	-	-	-	2 202	637 514
Natural gas plant operations .....	-	-	-	2 083	294 289
<b>Other operating expenditures</b>					
(a) Taxes (excluding income taxes) .....	27	-	-	192	125 716
(b) Royalties .....	-	-	-	4 344	3 105 858
(c) Interest expense .....	1 327	-	-	600	194 288
(d) Other .....	84	-	-	3 577	164 619
<b>Total</b> .....	94 204	12	-	434 743	8 719 195

**Figure 17**  
**Oil and Gas Exploration Expenditures**  
**Submitted for Work Credits**





# Production, Processing and Refining

## Oil

The Norman Wells Oil Field, lying in the west central part of the Northwest Territories, had 59 oil wells capable of production in 1978, with 39 producing regularly. Total gross field production during the year averaged 463.45 m<sup>3</sup>/d of oil plus 190 x 10<sup>3</sup>m<sup>3</sup> of gas, for yearly total of 169 158 m<sup>3</sup> of oil and 70.23 x 10<sup>6</sup>m<sup>3</sup> of gas.

The only refinery in Canada located North of 60 is at Norman Wells and is operated by Imperial Oil Limited. It has a calendar day capacity of 508 m<sup>3</sup>. In 1978, the refinery processed an average of 459 m<sup>3</sup> per day of locally produced crude oil. The total refinery output to the end of 1978 was 167 572 m<sup>3</sup>.

Oil in the Norman Wells complex is contained within the Kee Scarp formation. Esso Resources Canada Limited proposed a three-well, delineation drilling program, using grounded-ice drilling platforms, to confirm the extension of the productive Kee Scarp reservoir below the Mackenzie River. This program would be the second phase of a project designed to establish a sound reservoir data base for the Norman Wells field. The initial phase of this three-phase project was a seismic program completed during the winter of 1977/78. The delineation drilling this winter (1978/79) will be followed up with a multi-well logging program scheduled for the summer of 1979. Future plans for development of the reservoir will be contingent on the results of these programs. The reservoir data base is an essential prerequisite to any future consideration of economic feasibility and of alternative development methods.

## Gas

In The Northwest Territories, six gas wells in the Pointed Mountain Gas Field – G-62, K-45, O-46, P-53, F-38 and A-55, in grid area 60-30-123-45 – produced gas at a combined gross average rate of 1.61 x 10<sup>6</sup>m<sup>3</sup>/d (million cubic metres per day) plus 128.9 m<sup>3</sup>W/d (cubic metres of water per day) for a yearly total of 588.74 x 10<sup>3</sup>m<sup>3</sup> of gas and 47 099 m<sup>3</sup> of water.

The Beaver River Gas Field straddles the Yukon-British Columbia border with one well, Pan Am Beaver River Y.T. G-01, in grid area 60-10-124-15, in the Yukon portion of the field. This well was shut-in in August 1977 and abandoned on September 9, 1978.

Under the royalty-sharing, unitized-pool agreement between the British Columbia and the Federal Governments, 7 percent of the total Nahanni formation production, or 2.26 x 10<sup>6</sup>m<sup>3</sup> was assigned to the Yukon portion of the field for 1978. All wells in the Nahanni formation were shut-in by November 1978 with a total gas production for the year of 32.28 x 10<sup>6</sup>m<sup>3</sup>.

Development of the Kotaneelee gas field began during the year. The field is located 31.19 km southwest of the Pointed Mountain Field and 19.3 km northeast of the Beaver River Field. Construction of a 6.4 km – 219 mm O.D. gas gathering system and a gas dehydration facility with a capacity of 1699 x 10<sup>3</sup>m<sup>3</sup>/d is expected to be completed during February 1979. Initial production will be from the H-38 and E-37 wells which were drilled in 1977 and 1978 respectively. Westcoast Transmission Company will purchase and transport the gas through the 580 mm Pointed Mountain trunk line to their Clarke Lake gas processing plant at Fort Nelson. The gas contains 2.44% H<sub>2</sub>S and 16.99% CO<sub>2</sub> both of which will be removed at Fort Nelson.

# Pipelines

## The Foothills Project

The decision not to build the Mackenzie Valley Pipeline at present was made in 1977 and, in September, Canada and the United States signed an agreement to allow the construction of a natural gas pipeline for the transport of gas from Prudhoe Bay, Alaska to the Lower 48 States. Figure 18 shows roughly the proposed route. Under the agreement, a spur line from the Delta area (the Dempster lateral) could, if required or desired, be built in the 1980's. Foothills Pipe Lines Ltd. is the sponsor of the Canadian sections and Foothills (Yukon) Ltd., the parent company, completed its corporate restructuring by the incorporation of the six federal subsidiaries. (For company structure see Table 11).

Applications or supporting submissions by all participants were filed before the Federal Power Commission in the United States and National Energy Board in Canada in the summer and Fall of 1976.

The 731 miles of 48-inch mainline pipe in Alaska is the responsibility of Northwest Pipeline Corporation of Salt Lake City, Utah, and its future American partners in that section of the line.

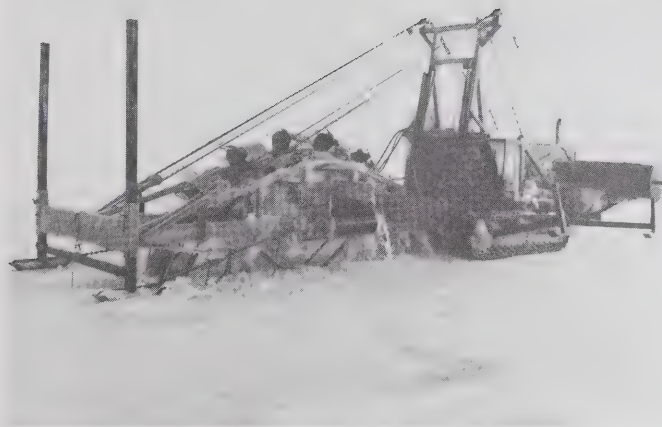
Under legislation introduced into the House of Commons, a new Northern Pipeline Agency was created to provide a single regulatory authority to undertake federal responsibilities for planning and monitoring construction of the pipeline system.

The initial capacity of the system is estimated as capable of carrying up to 2.4 billion cubic feet of United States gas daily and 1.2 billion cubic feet of Canadian gas.

Based on Foothills' objective of achieving some 90% input of Canadian goods and services in the project in this country – including the Dempster lateral – it is estimated that 100,000 man-years of employment would be created in Canada, directly as a result of the project and indirectly as a result of further economic activity generated by pipeline outlays. Excluding the Dempster lateral, the total man-years are estimated at approximately 68,000.

**Table 11 – Structure of Foothills Pipe Lines Ltd.**

<i>Subsidiary</i>	<i>To Be Owned</i>	<i>To construct, operate and manage</i>
Foothills Pipe Lines (South Yukon) Ltd.	100% by Foothills (Yukon)	the 512 miles in Yukon (56-inch pipe)
Foothills Pipe Lines (North B.C.) Ltd.	51% by Foothills (Yukon) 49% by Westcoast Transmission	440 miles across N.E. British Columbia to Alberta border (56-inch pipe)
Foothills Pipe Lines (Alberta) Ltd.	51% by Foothills (Yukon) 49% by Alberta Gas Trunk Line Co. Ltd.	806 miles in Alberta (56-inch, 42-inch and 36-inch pipe)
Foothills Pipe Lines (South B.C.) Ltd.	51% by Foothills (Yukon) 49% by Alberta Natural Gas Co. Ltd.	105 miles across S.E. British Columbia (36-inch pipe)
Foothills Pipe Lines (Sask.) Ltd.	51% by Foothills (Yukon) 49% by TransCanada Pipelines Ltd.	160 miles across S.E. Saskatchewan (42-inch pipe)
Foothills Pipe Lines (North Yukon) Ltd.	51% by Foothills (Yukon) up to 49% by TransCanada Pipelines Ltd.	to make application for and be responsible for the Dempster lateral when pipeline is required (737 miles of not less than 30-inch pipe).



Trenching through ice for pipe laying

Under the Canadian-USA Agreement, a start on pipe laying could not commence in the Yukon before January 1, 1981. Target date for commencement of system operations is currently 1984.

*The route and mileages of the Northern Pipeline are as follows;*

From Prudhoe Bay, Alaska, flanking Alyeska line southward to Fairbanks and southeast along route of Alaska Highway to Alaska-Yukon border: 731 miles

From Alaska border to Whitehorse in the Yukon, (connecting point for proposed 737-mile lateral to Mackenzie Delta) entering Northeast B.C. near Watson Lake and continuing southeast to enter Alberta near Boundary Lake and onward to James River near Caroline. Here the line divides into a western leg to Kingsgate, B.C. and an eastern leg to Monchy, Saskatchewan. Total distance in Canada including Dempster lateral: 2,765 miles

In the Lower 48 states, the western leg to California will be provided through looping of the existing system operated by Pacific Gas Transmission Co. and Pacific Gas and Electric Co., and the eastern leg to mid-western states will be constructed by the Northern Border Co. Total mileage: 1,991 miles

Total mileage of system through Canada and USA, including Dempster lateral: 5,487 miles

At the 1977 value of the dollar, estimated costs of the Foothills facilities amount to:

• Alaska .....	\$ 3.5 billion
• Canada, excluding the Dempster lateral .....	\$ 4.7 billion
• Lower 48 States .....	\$ 2.3 billion
Total cost .....	\$10.5 billion

### The Polar Gas Project

The Polar Gas Group, managed by Trans Canada Pipelines Ltd., was formed early in 1972 to investigate the feasibility of a natural gas pipeline from the Arctic Islands to southern markets. During 1977, it continued research and investigation into the construction and operation of such a line. On December 21, 1977, it filed an application with the National Energy Board and DINA for the necessary approvals to construct a 2340-mile (3765-km) pipeline, including 89 miles (143 km) of marine crossings. The estimated cost of this project is \$6.1 billion in 1976 dollars.

The proposed route would run from the Drake Point and Hecla natural gas fields on Melville Island, across Byam Channel, Byam Martin Island and Austin Channel to Bathurst Island, across Bathurst Island, Little Cornwallis Island, Cornwallis Island and Barrow Strait to Somerset Island. It would then proceed south on Somerset Island to reach the most northerly point of the mainland - the tip of Boothia Peninsula on the south shore of Bellot Strait. It would then run south through the District of Keewatin, N.W.T., to enter Manitoba north and west of Churchill and would cross Manitoba, enter Ontario just east of Kistigan Lake and continue southeast to terminate at an interconnection with the Trans Canada Pipelines system near Longlac Ontario.



The pipeline would have an outside diameter of 42 inches (1 067 mm) except in some channel and river crossings which will be crossed with parallel lines of pipe with an outside diameter of 36 inches (914 mm). The laterals to the gas processing plant in Melville Island will also have an outside diameter of 36 inches (914 mm).

The initial inlet capacity will be 1,350 million cubic feet per day, utilizing ten compressor stations. With an additional ten compressor stations, the capacity can be increased to 2,400 million cubic feet per day. The ultimate capacity, without looping, is 3,000 million cubic feet per day. This level of throughput would be achieved by the addition of yet another ten compressor stations, bringing the total number to thirty.

Proposed and existing northern pipeline routes are shown in Figure 18.

#### **Petro-Canada Arctic Liquefied Natural Gas (LNG) Pilot Project**

An application was filed with the National Energy Board by Polar Gas Group in January of 1979 for approval of a combined pipeline and LNG tanker project to move an average system capacity of  $7.065 \times 10^6 \text{ m}^3$  (250 MMscf) of gas from Melville Island to an East Coast port. The project is sponsored by a group comprising Petro-Canada, Alberta Gas Trunkline Company Limited and Melville Shipping Company. It involves the construction of 161 km (100 miles) of 559 mm (22-inch) gas transmission line with an operating pressure of 8 274 kPa (1,200 psi) from the Drake Point field on Melville Island to a terminal for LNG tankers at Bridport Inlet on the south-east coast of the Island. The LNG facility would be served by two Arctic Class 7 icebreaking tankers of  $145\,000 \text{ m}^3$  capacity. Originally it was proposed that the gas would be shipped to the Tenneco LNG terminal facilities to be situated at Lorneville, New Brunswick. These facilities were certified by the National Energy Board in late 1977 for the import of Algerian liquefied natural gas, regasification in Canada and export by a TransCanada (New Brunswick) pipeline to Maine, U.S.A. (see Figure 18).

It is currently proposed that the southern harbour be located at either the Strait of Canso in the Province of Nova Scotia, Lorneville in the Province of New Brunswick, or at a site on the St. Lawrence River in the Province of Quebec.

At whichever of the three prospective terminal points is selected, the LNG will be regasified in a plant constructed by the Applicants and served by harbour facilities constructed or augmented by the Applicants. The regasified LNG will be delivered to a pipeline facility, owned by the Applicants or others at the regasification plant outlet, for resale by direct delivery or displacement to a point or points to be selected on the international boundary between Canada and the United States.

Development of the project, including the supporting marine transport elements, would be considered as a pilot project and as a first step in the production and delivery of gas from the Arctic Islands. The Polar Gas Group also intends that the LNG project be developed in a manner that would enable it to be utilized in the extraction of smaller gas resources that may be found in other remote Arctic areas.

The project construction cost, stated in 1977 Canadian dollars, is estimated at \$1.1 million dollars. This does not include interest during construction, escalation nor a provision for working capital.

**PROPOSED**

ALCAN (FOOTHILLS) (gas)

DEMPSTER EXTENSION (gas)

POLAR GAS (gas)

**EXISTING**

ALYESKA (oil)

POINTED MOUNTAIN (gas)

WESTCOAST (gas)

SCALE OF MILES



# Participation and Research Projects

The number of participation and research projects was lower in 1977, with some five individual projects being undertaken. Expenditures incurred for these projects qualify for work credits and, when approved, can be applied to permits in designated approved areas. Major programs in these categories in 1978 included:

## **Geophysical Surveys**

Eureka Exploration Ltd. carried out one reconnaissance seismic program this past year, a 1,000-mile project in the Beaufort Sea. This was only partially completed due to limited ship availability.

## **Research Programs**

Arctic Petroleum Operators Association (APOA) continued its heavy investment of effort and money in environmental and engineering research projects in the Far North. It initiated five new projects in 1978 as well as continuing several other studies. The new projects dealt mainly with ice mechanics and ice defense systems research. Imperial Oil, Aquitaine and other operators continued major environmental research projects in the Baffin Bay as a requirement for their application for Drilling Authorities.

## **EAMES**

In November 1977, the Minister of Indian Affairs and Northern Development announced the setting up of a study program for the offshore areas of the Eastern Arctic. The object is to provide sufficient environmental impact data on which decisions for the granting or withholding of exploratory drilling permits at sites in the area can be made. The program is known as the Eastern Arctic Marine Environmental Studies or EAMES and covers the area indicated in Figure 19. The waters off the east coast of Baffin Island are of principal interest in that they overlie formations considered potentially high in oil and gas.

Before drilling is permitted it is considered essential that the environmental conditions and constraints be determined in order to protect all segments of the ecology, and to ensure that adequate techniques, safeguards and remedies are known and available to cope with any possible disturbances or emergencies that drilling might create. This is the first time the initial approach to the exploration of a region has involved the studying of its total ecology as a complete whole rather than limiting research to the environment of a specific area.

The most vital areas are Lancaster Sound, Baffin Bay and Davis Strait. The research is expected to take four years, but in view of the urgent need for oil, every effort is being made to reduce this time. Some studies by industry have already been completed.

The federal departments of EMR, DFE and DINA will all be involved, with the management committee under the Chairmanship of a DINA representative, but the work itself will be the responsibility of Industry. The federal departments will, of course, cooperate with any facilities or studies they alone can provide. As much use as possible will be made of the local Inuit knowledge and skills and the native people of the eastern Arctic will be included and actively involved in the planning and conduct of the studies. In addition to four specialists familiar with the coastal and offshore environment, and two representatives of the petroleum industry, the Advisory Board set up to assist the Management Committee will also include local and native representatives from ten communities in the area.





Helicopter services seismic drilling units on Arctic Islands

All environmental elements of the area are included in the program, land aspects as well as marine: wild-life, climate, fresh water and salt water areas, the shallow sea waters as well as the deep, ice conditions, waves and currents, the effects of possible oil spills and techniques to be developed to deal with them, and any other aspect that may, in the course of the study, be found to be relevant.

The program will be funded jointly by the federal government and industry, with industry bearing the largest share. Costs are anticipated to be well in excess of \$12 million.

**Figure 19**  
**Eastern Arctic Marine Environmental**  
**Study Area (EAMES)**



# Appendix I

Source of Information Relative to  
Oil and Gas Activity North of 60°

## Publications

### A. Maps

Many maps dealing with the northern resources activities are published by the Northern Non-Renewable Resources Branch and are available from the Oil and Gas Exploratory Operations Section, Calgary, Alberta, or from the Director, Northern Non-Renewable Resources Branch, Ottawa. The Branch publishes a list of maps which may be obtained from either of the above sources.

### B. Reports

The following reports may be obtained from Supply and Services Canada, Printing and Publishing. Pre-payment is required.

Schedule of Wells 1921-1971	\$10.00
Schedule of Wells 1972	5.00
Schedule of Wells 1973	5.00
Schedule of Wells 1974	5.00
Schedule of Wells 1975	5.00
Schedule of Wells 1976	5.00
Schedule of Wells 1977	5.00
Schedule of Wells 1978	25.00 in press
Oil and Gas Statistical Report No. 1 (1920-1960)	(out of print)
Oil and Gas Statistical Report No. 2 (1921-1972)	5.00

#### *Technical Reports available for Inspection 1977-78*

(Geological and Geophysical Reports released from confidential status are available for public inspection only in the office of the Oil and Gas Exploratory Operations Section of this department in Calgary); - no charge (in press).

## Other Sources of Information

Information on northern resources activities can be obtained from the Director, Northern Non-Renewable Resources Branch, Department of Indian and Northern Affairs, Ottawa, Ontario. All cores and samples from wells drilled on Canada lands north of 60° N. latitude are stored at the Institute of Sedimentary and Petroleum Geology, 3303-33rd St. N.W., Calgary, Alberta. Samples and cores for wells which have been released from confidential status pursuant to the Canada Oil and Gas Land Regulations and the Canada Oil and Gas Drilling and Production Regulations may be inspected at the Institute. A list of such wells may be obtained from the Director, Northern Non-Renewable Resources Branch.

Specialized and technical literature pertaining to northern Canada may be obtained from the following government agencies:

### **Department of Indian and Northern Affairs**

Departmental Library, 10 Wellington St.

HULL, Quebec

(1) Oil and Gas Exploratory Operations Section,  
Department of Indian and Northern Affairs, Calgary.

### **Department of Energy, Mines and Resources**

(1) Geological Survey of Canada - Ottawa, Ontario  
and Vancouver, British Columbia.

(2) Institute of Sedimentary and Petroleum Geology -  
Calgary, Alberta.

(3) Atlantic Geoscience Centre, Bedford Institute of  
Oceanography - Dartmouth, Nova Scotia.

(4) Pacific Geoscience Centre, Patricia Bay Institute  
of Ocean Sciences, Sidney, British Columbia.

(5) Earth Physics Branch - Ottawa, Ontario.

### **Department of National Defence**

Defence Research Board, Scientific Information  
Service - Ottawa, Ontario.



### ***Transport Canada***

(1) Canadian Coast Guard – Ottawa, Ontario.

Branches – Aids and Waterways

- Fleet Systems

- Ship Safety

- Coast Guard Emergencies

- Telecommunications and Electronics

Branch,

Edmonton, Alberta and Ottawa, Ontario.

(2) Civil Aviation Branch – Winnipeg, Manitoba.

### ***Arctic Institute of North America —***

Calgary, Alberta.

### ***National Research Council —***

Ottawa, Ontario.

### ***Public Libraries***

The following brochures published by the Department of Indian and Northern Affairs may be available in some Public Libraries:

- i. Guide to Northern Non-Renewable Resources
- ii. Communication and Transportation Facilities  
Queen Elizabeth Group – Arctic Islands
- iii. Resources Management Division – Responsibilities and Administration
- iv. Oil and Gas Canada Lands – Volume No. 2
- v. Oil and Gas Canada Lands – Edition No. 3
- vi. Oil and Gas in the Yukon and Northwest Territories – Edition No. 4 – 1967
- vii. Oil and Gas – North of 60 – 1968
- viii. Oil and Gas – North of 60 – 1969
- ix. Oil and Gas – North of 60 – 1970
- x. Oil and Gas – North of 60 – 1971
- xi. Oil and Gas – North of 60 – 1972
- xii. Oil and Gas – North of 60 – 1973
- xiii. Oil and Gas – North of 60 – 1974
- xiv. Oil and Gas – North of 60 – 1975
- xv. Oil and Gas – North of 60 – 1976
- xvi. Prospectus – North of 60

### ***Information and Procedures Concerning Operations of Canada Lands***

Certain federal agencies are concerned with exploration of Canada lands and must be notified prior to the commencement of any exploration activity. The operator or permittee, not the contractor, is responsible for providing the requisite advance notice of planned programs to these agencies by writing directly to them.

For offshore programs, the Director, Northwest Territories Region, Northern Affairs Program, Dept. of Indian and Northern Affairs at Yellowknife, Northwest Territories, in addition to the Northern Non-Renewable Resources Branch, must be informed with respect to each program. He will communicate with every department and agency on a need-to-know basis with respect to Marine Geophysical Programs. In the case of the Hudson Bay region, operators must also inform the National Research Council of Canada of proposed operations to be undertaken during the summer months.

Circumstances may be such that other agencies should be notified as well, and these are listed on the following pages, together with the names of persons who can be of assistance. For example, since operators are responsible for any damage they may cause to underwater commercial cables, it is recommended that they contact the Canadian Hydrographic Service for cable-lay data covering the area over which the work is to be performed. Similarly, the Department of National Revenue, Customs and Excise should be contacted by the importing company if vessels or equipment are to be brought in from abroad.

Information in the brochure Communication and Transportation Facilities Queen Elizabeth Group, Arctic Islands, is being updated and will be available in a comprehensive report entitled Operational Guide for Oil and Gas Companies in the North. This publication is now in preparation and should be available by December 1978. In addition to information concerning communication and transportation, the report will contain information covering all aspects to exploration in the North.

**Department of Indian and Northern Affairs**

Pursuant to Section 52 of the Canada Oil and Gas Land Regulations, Notice of Commencement of Exploratory Work must be filed 15 days prior to commencement of proposed exploratory programs (geophysical, geological and Research) on the mainland in the Northwest Territories and Yukon Territory and Arctic Islands, and 45 days prior to commencement of geophysical work on offshore areas, with the Oil and Gas Exploratory Operations Section, Northern Non-Renewable Resources Branch, Department of Indian and Northern Affairs, 112-11th Avenue, S.E., CALGARY, Alberta T2G 0X5.

Information and assistance may also be obtained from:

Director,  
Northern Non-Renewable Resources Branch,  
Department of Indian and Northern Affairs,  
OTTAWA, Ontario  
K1A 0H4

Name: Dr. H.W. Woodward  
Phone: 819-997-9339

or from:

Chief,  
Oil and Gas Lands Division,  
Name: P. Sullivan  
Phone: 819-997-9741

Advice on exploratory programs and operational matters may be obtained from:

Head,  
Oil and Gas Exploratory Operations Section,  
Name: S.A. Kanik  
Phone: 819-997-9444

Drilling authority and advice on drilling matters can be obtained from the District Conservation Engineer for the appropriate District. (See Fig. No. 20 for District boundaries).

**Oil and Gas Engineering Division**

Chief Petroleum Engineer – Appointment pending  
Head, Drilling and Completion

Engineering Section – M.K. El-Defrawy  
Head, Reservoir Engineering,  
Production Systems Engineering  
and

Special Projects Section – I.M. Feldman  
Head, Pipelines

Engineering Section – Appointment pending

Regional Oil and Gas  
Conservation Engineer,  
N.W.T. – M.D. Thomas  
Yellowknife  
403-920-8110

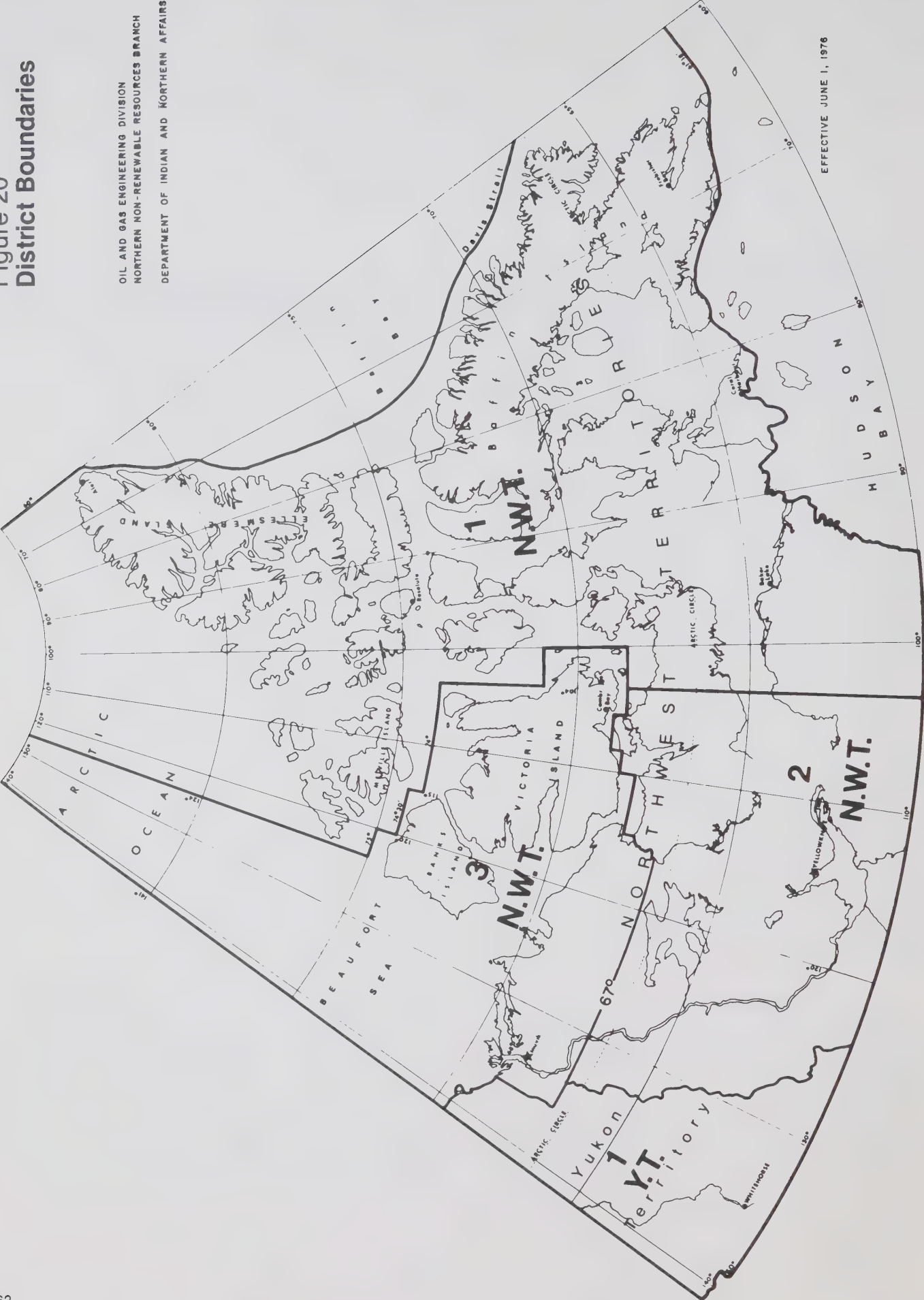
Regional Oil and Gas  
Conservation Engineer,  
Y.T. – G.E. Blue  
Whitehorse

District Oil and Gas  
Conservation Engineers – Appointment Pending  
for Arctic Islands in  
Yellowknife, District 1  
N.W.T.  
– Appointment Pending  
for Southern Sector,  
(South of 67°) N.W.T. in  
Yellowknife, District 2  
N.W.T.  
– D.R. Whitehead for the  
Northern Sector, (North  
of 67° & Beaufort Sea)  
N.W.T. in Inuvik,  
District 3, N.W.T.

A Land Use Permit must be acquired for every land use operation, including drilling operations. A water licence or water authorization is required for all water use in accordance with the Northern Inland Waters Act and Regulations. Advance notice of 90 days is required before the start of drilling operations and all seismic activities, including marine seismic surveys involving the use of high explosives, in the event that qualified observers are needed. Notice of 45 days to the Regional Director is also required before the start of a seismic survey in which a source of acoustical energy other than high explosives is to be used.

Figure 20  
District Boundaries

OIL AND GAS ENGINEERING DIVISION  
NORTHERN NON-RENEWABLE RESOURCES BRANCH  
DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS





Information and advice on the Land Use Regulations, Land Use Permits and water use authorization can be obtained:

For the Northwest Territories:  
Director,  
Northern Territories Region,  
Northern Affairs Program,  
P.O. Box 1500,  
YELLOWKNIFE, N.W.T. X0E 1H0  
Name: R. Hornal  
Phone: 408-873-4421

For the Yukon Territory:  
Director,  
Yukon Territory Region,  
Northern Affairs Program,  
200 Range Road,  
WHITEHORSE, Y.T. Y1A 3V1  
Name: B.J. Trevor  
Phone: 403-668-5151

**Department of Energy, Mines and Resources**  
**Resource Management and Conservation Branch**

The Resource Management and Conservation Branch is responsible for the administration of federal interest in the mineral resources off Canada's east and west seacoasts and in the Hudson Bay and Hudson Strait regions.

As a general rule all correspondence should be addressed to:

Dr. D.G. Crosby,  
Director-General,  
Resource Management and Conservation Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E4

The Branch may be reached by:  
Telephone: (613) 995-9351  
Telex: 053-4366  
Telecopier: 996-5707

*The Mineral Rights Division of the Branch*, through the issuance of exploration permits and production leases, makes available rights to mineral development on all Canada lands in the Offshore excluding the High Arctic; and ensures that holders of such terminable grants fulfill the terms and obligations stipulated in the Regulations in order to maintain their interests in good standing.

Advice and assistance on matters relating to the disposition and administration of mineral rights, such as the issuance and terms of permits and leases and expenditures allowable for credit against permit or lease work obligations, may be obtained from:

D.L. Tough,  
Director,  
Mineral Rights Division,  
Resources Management and Conservation Branch,  
OTTAWA, Ontario K1A 0E4

*The Resources Geology Division of the Branch* evaluates geological and geophysical information submitted by offshore operators, and assesses the mineral resource potential of prospects and specific areas in Canada's offshore regions, as well for federally-owed mineral rights in the Provinces, for resource management purposes. The Division is also responsible for the handling and curation of lithologic and paleontologic material from offshore wells, and for the assembly and maintenance of a data bank of geological and geophysical information from the offshore.

Requirements and procedures with regard to the submission, confidentiality and subsequent examination of geophysical and geological data, including well materials, as well as sources of geological information and related matters, may be obtained from the office of:

D.F. Sherwin,  
Director,  
Resource Geology Division,  
Resource Management and Conservation Branch,  
OTTAWA, Ontario K1A 0E4

*The Operations and Conservation Division of the Branch* exercises regulatory control over all activities associated with exploration, drilling, production conservation and conservation of offshore oil and gas. This control includes the analysis of operational hazards, of proposed equipment and installations in the Offshore and the nature and economic potential of reservoirs. Operators must meet the requirements of the Division as regards the safety of personnel, the protection of the environment, the prevention of pollution and waste, and the conservation of resources.

Assistance on such operational matters as the drilling, testing, completion or plugging of offshore wells; offshore structures; geophysical surveys; reporting requirements; pollution contingency plans; offshore environmental and feasibility projects; and the availability of reports after their release from confidential status may be obtained from the office of:

Director,  
Operations and Conservation Division,  
Resources Management and Conservation Branch,  
OTTAWA, Ontario  
K1A 0E4

Name: G.R. Yungblut

Phone: (613) 995-9351

After hours: (613) 722-9286

or from other engineers in the Division including:

F.H. Lepine,

Head,

Drilling and Operations Section

Phone: (613) 995-9351

On the East Coast, information and assistance on operational matters and on the examination of well materials, in addition to exploration and assessment reports, is available from the Branch's Regional Office in Dartmouth:

East Coast Offshore Operations Manager,  
Resource Management and Conservation Branch,  
Department of Energy, Mines and Resources,  
Bedford Institute of Oceanography,  
P.O. Box 1006,

DARTMOUTH, Nova Scotia

B2Y 4A2

Name: T.W. Dexter

Phone: (902) 426-3179

After hours: (902) 477-5886

*The Environmental Assessment Division of the Branch* assesses the environmental and sociological consequences of offshore mineral resource activity to ensure that projects are environmentally safe as regards the biological and physical regimes and socially and economically acceptable as regards the region's coastal communities.

The Division's responsibilities include: the evaluation of weather, sea and ice conditions in operational areas; the assessment of the effects of offshore operations on the marine and coastal biota; the approval of oil spill contingency plans submitted by Industry; and the promotion of environmental research such as the Offshore Labrador Biological Studies (OLABS) programme.

For further information contact:

Mr. Bell, Director,

Environmental Assessment Division,

Resource Management and Conservation Branch,

Department of Energy, Mines and Resources,

Ottawa, Ontario K1A 0E4

#### *Surveys and Mapping Branch*

Information on the systems, methods and equipment utilized for positioning and surveying with respect to exploration work may be subject to review by this agency. Moreover, legal surveys must be made in accordance with instructions of the Surveyor General.

Inquiries concerning surveying may be directed to:

Surveyor General and Director,

Legal Surveys Division,

Surveys and Mapping Branch,

Department of Energy, Mines and Resources,

OTTAWA, Ontario K1A 0E9

Name: W.V. Blackie

Phone: (613) 995-4341

Information concerning control surveys may be obtained from:

Geodetic Survey Division,

Surveys and Mapping Branch,

Department of Energy, Mines and Resources,

OTTAWA, Ontario K1A 0E9

Name: C.E. Hoganson

Phone: (613) 995-4024

When requesting control survey data, the inquiries should define the area involved by latitude and by longitude, and should indicate that the data is required for surveys relating to oil and gas exploration.

Air photographs covering all portions of Canada may be obtained from:

National Air Photo Library,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E9  
Phone: (613) 995-4061  
Attention: G. Nitschky

and  
Publications and Air Photo Section,  
Institute of Sedimentary and Petroleum Geology,  
3303 - 33rd Street, N.W.,  
CALGARY, Alberta T2L 2A7  
Phone: (403) 284-0110  
Attention: Mrs. D. Cormier

Topographic maps, indices, charts, atlases and numerous other map publications may be obtained from:

Canada Map Office,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E9  
Phone: (613) 998-3865  
Attention: P.K. Andrews

and  
Publications and Air Photo Section,  
Institute of Sedimentary and Petroleum Geology,  
3303 - 33rd Street, N.W.,  
CALGARY, Alberta T2L 2A7  
Phone: (403) 284-0110  
Attention: Mrs. D. Cormier

D.I.A.N.D.  
Mining Recorder,  
Map Office,  
Box 1500,  
YELLOWKNIFE, N.W.T. X1A 2R3

Regional Geologist,  
D.I.A.N.D.,  
N.N.R. and E.B.,  
200 Range Road,  
WHITEHORSE, Y.T.  
Y1A 3V1

Geological Survey of Canada,  
Information Service and Sales,  
Dept. of E.M.R.  
100 West Pender St., 6th Floor,  
VANCOUVER, B.C. V6B 1R8

Maritimes Resource Management Services,  
Information Centre,  
Box 310,  
16 Station St.,  
AMHERST, N.S. B4H 3Z5

Ministère de l'Énergie des Mines et des Ressources  
Bureau Régional de Vente de Cartes  
1535 Chemin Ste-Foy  
QUEBEC (Québec)  
G1S 2P1

### ***Geological Survey of Canada***

The Geological Survey of Canada carries out systematic geological and geophysical surveys in the sedimentary basins of Canada, including parts of the regions offshore from the east and west coasts, in Hudson Bay, and in the Arctic Islands.

Inquiries with regard to the operations and publications of the Geological Survey should be made to:  
Director-General,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E8  
Name: D.J. McLaren  
Phone: (613) 995-4208

or to:  
Director,  
Institute of Sedimentary and Petroleum Geology,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
CALGARY, Alberta T2L 2A7  
Name: D.F. Stott  
Phone: (403) 284-0110

or to:  
Director,  
Atlantic Geoscience Centre,  
Department of Energy, Mines and Resources,  
P.O. Box 1006,  
DARTMOUTH, Nova Scotia B2Y 4A2  
Name: M.J. Keen  
Phone: (902) 426-2367



or to:

Head, Marine Geology Section,  
Pacific Geoscience Centre,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
Box 6000,  
SIDNEY, British Columbia V8L 4B2  
Name: D.L. Tiffin  
Phone: (569) 656-8423

### ***Polar Continental Shelf Project***

The Polar Continental Shelf Project is a continuing investigation of the continental shelf fringing the Arctic coast of Canada, together with adjacent parts of the Arctic Ocean basin, the islands of the Canadian Arctic Archipelago and the intervening waters, and other areas of special interest.

Inquiries regarding surveys and scientific studies in Arctic areas may be directed to:

Director,  
Polar Continental Shelf Project,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E4  
Name: G. Hobson  
Phone: (613) 996-3388

### ***Earth Physics Branch***

The Earth Physics Branch operates a network of Arctic geophysical observatories and carries out systematic geophysical surveys and studies throughout Canada including the Arctic.

Inquiries with regard to the scientific studies, surveys and publications of the Earth Physics Branch should be directed to:

Director-General,  
Earth Physics Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0Y3  
Name: K. Whitham  
Phone: (613) 995-5464

## **Department of Fisheries and Oceans**

### ***Fisheries Management***

Information on the following fisheries matters may be obtained from:

Yukon freshwater and marine fish:

Director-General,  
Fisheries Management,  
Fisheries and Oceans,  
1909 West Pender Street,  
VANCOUVER, B.C. V6E 2P1  
Name: Dr. E. Johnson  
Phone: (604) 666-6097

Northwest Territories freshwater fish, including Arctic char:

Director-General,  
Fisheries Management,  
Fisheries and Oceans,  
Freshwater Institute,  
501 University Crescent,  
WINNIPEG, Manitoba R3T 2N6  
Name: Dr. G.H. Lawler  
Phone: (204) 269-7379

Northwest Territories including Hudson Bay, marine fish and marine mammals:

Director,  
Arctic Biological Station,  
Fisheries and Oceans,  
STE. ANNE DE BELLEVUE, Québec  
H9X 3L6  
Name: Dr. A. Mansfield  
Phone: (514) 457-3660

General information on environment assessment studies and research relating to contaminants in freshwater and marine water of the Arctic:

Director,  
Aquatic Environment Branch,  
Fisheries and Oceans,  
240 Sparks Street,  
OTTAWA, Ontario K1A 0E6  
Name: Dr. J.C. MacLeod  
Phone: (613) 995-1818

### *Ocean and Aquatic Sciences*

The Canadian Hydrographic Service Publishes charts of Canadian navigable waters.

General information concerning charts may be obtained from:

Canadian Hydrographic Service,  
Department of Fisheries and Oceans,  
615 Booth Street,  
OTTAWA, Ontario K1A 0E6  
Name: Mr. L.P. Murdoch  
Phone: (613) 995-4437

Information concerning charts showing Canada's Territorial Sea and Fishing Zone Limits and related data may be obtained from:

Canadian Hydrographic Service,  
Department of Fisheries and Oceans,  
OTTAWA, Ontario K1A 0E6  
Name: Territorial Waters Officer  
Phone: (613) 995-4450

Commercial Cable-lay data may be obtained from:

Canadian Hydrographic Service,  
Department of Fisheries and Oceans,  
615 Booth Street,  
OTTAWA, Ontario K1A 0E6  
Name: Mr. J. Bruce  
Phone: (613) 995-4651

Information on tides may be obtained from:

Tides, Currents and Water Levels,  
Canadian Hydrographic Service,  
Department of Fisheries and Oceans,  
615 Booth Street,  
OTTAWA, Ontario K1A 0E6  
Name: Dr. W.F. Forrester  
Phone: (613) 995-4511

Information on hydrographic surveys and control data in the Eastern Arctic may be obtained from:

Regional Hydrographer,  
Canadian Hydrographic Service,  
Atlantic Oceanography Laboratory,  
Department of Fisheries and Oceans,  
Bedford Institute of Oceanography,  
DARTMOUTH, N.S. B2Y 4A2  
Name: Mr. T.B. Smith (Acting)  
Phone: (902) 426-3497

Information on hydrographic surveys and control data in the Western Arctic may be obtained from:

Regional Hydrographer,  
Canadian Hydrographic Service,  
Department of Fisheries and Oceans,  
Institute of Ocean Sciences,  
SIDNEY, B.C. V8L 4A8  
Name: Mr. M. Bolton  
Phone: (604) 656-8347

Physical and Chemical Oceanography. Information on the following matters may be obtained from:

*Western Arctic* (Beaufort Sea and Sverdrup Basin):  
Director-General,  
Ocean and Aquatic Sciences,  
Department of Fisheries and Oceans,  
Institute of Ocean Sciences,  
SIDNEY, B.C. V8L 4B2  
Name: Dr. R.W. Stewart  
Phone: (604) 656-8215

*Eastern Arctic* (Baffin Bay and Davis Strait):

Director-General,  
Ocean and Aquatic Sciences,  
Department of Fisheries and Oceans,  
Bedford Institute of Oceanography,  
DARTMOUTH, N.S. B2Y 4A2  
Name: Dr. C.R. Mann  
Phone: (902) 426-3492

*Central Arctic* (including Hudson Bay and James Bay):

Director,  
Ocean and Aquatic Sciences,  
Canada Centre for Inland Waters,  
Department of Fisheries and Oceans,  
P.O. Box 5050,  
BURLINGTON, Ontario  
L7R 4A6  
Name: D.W. McCulloch  
Phone: (416) 637-4673

Data on physical-chemical oceanography, tidal predictions, wave climate, etc.:

Director,  
Marine Environmental Data Service,  
Ocean and Aquatic Sciences,  
Department of Fisheries and Oceans,  
240 Sparks Street,  
OTTAWA, Ontario K1A 0E6  
Name: Dr. J.R. Wilson  
Phone: (613) 995-2007

General information on oceanographic activities in the Arctic:

Director-General,  
Marine Sciences and Information Directorate,  
Ocean and Aquatic Sciences,  
Department of Fisheries and Oceans,  
240 Sparks Street,  
OTTAWA, Ontario K1A 0E6  
Name: Dr. N.J. Campbell  
Phone: (613) 995-2039

#### **Department of Environment**

This agency is advised on a need-to-know basis by the Regional Director of Resources, Department of Indian and Northern Affairs, of any drilling operations and all seismic activities, including marine seismic surveys, involving the use of high explosives in the event that qualified observers are needed. Information regarding the Department's requirement can be obtained from:

Assistant Deputy Minister,  
Environmental Production Service,  
Department of Environment,  
15th Floor, Place Vincent Massey,  
OTTAWA, Ontario K1A 0H3  
Name: Mr. R.M. Robinson  
Phone: (819) 997-1575 or 997-1576

#### ***Environmental Management Service***

Information concerning wildlife such as the locations of migratory bird sanctuaries and National Wildlife Areas, and the Arctic Ecology Maps Series that show important and critical wildlife areas of the Canadian Arctic where human activities can have adverse or destructive impact on wildlife population may be obtained from:

Director-General,  
Canadian Wildlife Service,  
Department of Environment,  
17th Floor, Place Vincent Massey,  
OTTAWA, Ontario K1A 0H3  
Name: Mr. A. Loughrey  
Phone: (819) 997-1301

Information concerning research into oil spills in icy waters; stream flow; water levels and quality; permafrost hydrology, flood forecasting; river basin planning; sediment surveys; ice studies; and water demand, supply, use, diversion and conservation; and environmental impact assessment, may be obtained from:

Inland Waters Directorate,  
Environmental Management Service,  
Department of Environment,  
6th Floor, Place Vincent Massey,  
OTTAWA, Ontario K1A 0H3  
Phone: (819) 997-3119

Information concerning northern forests and vegetation; their mapping; growth; relationship to terrain, soils and landscapes; and stability, may be obtained from:

Director-General,  
Canadian Forestry Service,  
Department of Environment,  
19th Floor, Place Vincent Massey,  
OTTAWA, Ontario K1A 0H3  
Name: Dr. R.J. Bouchier  
Phone: (819) 997-1454

or

Director,  
Forest Management Institute,  
Canadian Forestry Service,  
Department of Environment,  
396 Cooper Street,  
OTTAWA, Ontario K1A 0H3  
Name: Dr. L. Sayn-Wittgenstein  
Phone: (613) 996-1674



or  
Director,  
Northern Forest Research Centre,  
Canadian Forestry Service,  
Department of Environment,  
5320 - 122 Street,  
EDMONTON, Alberta T6H 3S5  
Name: Dr. G.T. Silver  
Phone: (403) 435-7210

or  
Director,  
Pacific Forest Research Centre,  
Canadian Forestry Service,  
Department of Environment,  
506 West Burnside Road,  
VICTORIA, B.C. V8Z 1M5  
Name: Mr. H. Drinkwater  
Phone: (604) 388-3811

The map series, entitled Land Use Information Series (for northern Canada), provides extensive data on renewable resources and related human activities. Coverage now includes all of the Yukon Territory, the Mackenzie Valley and the Great Slave Lake region. Enquiries for obtaining this map series may be directed to:

Canada Map Office,  
Department of Energy, Mines and Resources,  
130 Bentley Avenue,  
OTTAWA, Ontario K1A 0E9  
Phone: (613) 994-9663

Further information on the series may be obtained from:

Lands Directorate,  
Department of Environment,  
20th Floor, Place Vincent Massey,  
OTTAWA, Ontario K1A 0H3  
Name: Mr. K. Taylor  
Phone: (819) 997-2240

#### ***Atmospheric Environment Service***

Requests for information and assistance on meteorological and sea-ice data, climatology, weather forecasting, meteorological instruments and research may be directed to:

Assistant Deputy Minister,  
Atmospheric Environment Service,  
Department of Environment,  
4905 Dufferin Street,  
DOWNSVIEW, Ontario M3H 5T4  
Name: Dr. A.E. Collin  
Phone: (416) 667-4760

Information may also be obtained through the Meteorological Liaison Officer in Ottawa. This position is filled on a rotation basis and the name of the officer is subject to change.

Inquiries in Ottawa may be directed to:

Liaison Meteorologist,  
Department of Environment,  
13th Floor, Fontaine Building,  
OTTAWA, Ontario K1A 0H3  
Name: D.J. Wright  
Phone: (819) 997-1588

#### ***Environmental Assessment Panel***

Under the federal Environmental Assessment and Review Process, projects with potentially significant environmental effects are referred to the Panel by other federal departments and agencies for review. Projects concerned are those initiated by federal departments and agencies or involving federal funds and property. Further information may be obtained from:

Chairman,  
Environment Assessment Panel,  
Department of Environment,  
13th Floor, Fontaine Building,  
OTTAWA, Ontario K1A 0H3  
Name: Mr. F.G. Hurtubise  
Phone: (819) 997-3426

#### ***Department of National Defence Maritime Command***

The appropriate office of Maritime Command will be advised on the need-to-know basis by the Regional Director of Resources of any exploration program proposed for the offshore.

Operations in Baffin Bay and Arctic waters east of longitude 105° West are handled by the office of:  
Commander Maritime Command,  
Department of National Defence,  
F.M.O.  
HALIFAX, N.S. B3K 2X0

Operations in Arctic waters west of longitude 105°W are handled by the office of:  
Commander Maritime Forces Pacific,  
Department of National Defence,  
F.M.O.  
VICTORIA, B.C.  
V0S 1B0

Operations on-shore North of 60 are handled by the office of:  
Commander Northern Region,  
Evans Block,  
P.O. Box 6666,  
YELLOWKNIFE, N.W.T.  
X1A 2R3

### ***Search and Rescue***

The Department of National Defence is responsible for the co-ordination of search and rescue (SAR) operations in Canada.

The overall Canadian area of responsibility is divided into four SAR areas as listed below:

### ***Edmonton SAR***

This area includes the three Prairie provinces, all of the Northwest Territories Mainland and Arctic Islands, the western half of Hudson Bay, and Baffin Island north of 70°N.

The contact is:  
Edmonton Search and Rescue Region  
Phone: (403) 973-8402

### ***Victoria SAR***

This area includes British Columbia, Canadian waters off the west coast, the Yukon Territory and the Beaufort Sea south of 70°N and west of 135°W.

The contact is:  
Victoria Search and Rescue Region  
Phone: (604) 388-1543

### ***Halifax SAR***

This area includes Quebec east of 70°W, the Maritime Provinces, Labrador, Canadian waters off the East Coast, Foxe Basin, Hudson Strait and Baffin Island south of 70°N.

The contact is:  
Halifax Search and Rescue Region  
Phone: (902) 402-4730 or 426-4735

### ***Trenton SAR***

This area includes all Ontario, Quebec west of 70°W, eastern Hudson Bay and James Bay.

The contact is:  
Trenton Search and Rescue Region,  
Phone: (613) 392-2811 Locals 3870, 3875

Any of the following may also be contacted in case of emergencies: Air Traffic Control Centres, airport control towers, radio stations, marine radio stations, RCMP detachment, provincial and municipal police stations.

The following information is required when making an *Alert Report*:

- a. Name of caller, phone number, and official connection, e.g., RCMP detachment commander, aircraft owner, etc.;
- b. Assistance required;
- c. Description of aircraft, boat, or whatever craft is involved;
- d. Full details as to the nature of distress or emergency.

### ***Department of Transport***

#### ***Aid and Waterways Branch***

This branch includes three divisions which might have a particular interest in offshore exploration programs:

The Vessel Traffic Management and Information Systems Division requires at least 60 days notice before the commencement of any offshore exploration program, in order that they may issue the appropriate local Notices to Mariners. These notices receive world-wide distribution on a weekly basis.

The Marine Aids Division is responsible for identifying any aids to navigation devices that may be necessary for the program.

The Navigable Waters Protection Act Programs Division requires advance notice of 90 days in any case where drilling involves the territorial sea, in order for approval to be granted under the Navigable Waters Protection Act.

All communications on these matters should be directed to:

Director,  
Aids and Waterways Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario K1A 0N7  
Name: J.N. Ballinger  
Phone: (613) 992-2234

In addition, there are a number of Departmental officers who may be contacted in the field should the need arise. Regional Offices of the Canadian Coast Guard are located in St. John's, Nfld., Dartmouth, N.S., Quebec, Que., Toronto, Ont., and Vancouver, B.C.

#### ***Fleet Systems Branch***

This Branch has major responsibilities in two areas of concern in offshore operations; support of shipping in ice-congested waters, and marine search and rescue.

If operations are being contemplated for areas where ice may be a problem and where ice-breakers or other support may be desired, there should be consultation with the Director, Fleet.

Further information and assistance may be obtained from:

Director,  
Fleet Systems Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario K1A 0N7  
Name: Capt. J.Y. Clarke  
Phone: (613) 992-4209

#### ***Search and Rescue (Marine)***

The Canadian Coast Guard of the Department of Transport, Marine Administration is responsible for providing marine Search and Rescue vessels and the Canadian Coast Guard Marine Controllers who work with Defence personnel in co-ordinating the marine input to search and Rescue operations for the Rescue Co-ordination Centres (RCC's) in Victoria, Trenton and Halifax. CCG personnel completely man the Search and Rescue Emergency Centres in St. John's and Quebec. There are no CCG personnel in the RCC Edmonton. The Canadian Coast Guard is responsible for marine accident prevention through boating safety education and regulations and for the organizing and managing of the Canadian Marine Rescue Auxiliary. The Commissioner of the Canadian Coast Guard is Co-Chairman of the Interdepartmental Committee on Search and Rescue (ICSAR) which is responsible for co-ordinating the Search and Rescue efforts of the Departments of National Defence and Transport.

Director, Fleet Systems as above.

(or)  
Chief, Search and Rescue,  
Canadian Coast Guard,  
Name: A.F. Mountain  
Phone: (613) 995-5861

Their titles and addresses are given below:

(i) District Manager,  
Canadian Coast Guard,  
Transport Canada,  
101 Boulevard Champlain,  
QUEBEC, Quebec G1K 4H9  
Phone: (418) 694-3420

(This office handles aids to navigation in Hudson Bay and Strait area).

(ii) District Manager,  
Canadian Coast Guard,  
Transport Canada,  
P.O. Box 5002,  
HAY RIVER, N.W.T. 0XE 0R0  
Phone: (403) 874-2406



### **Ship Safety Branch**

This Branch includes the Steamship inspection Division, the Registry of Shipping, and the Nautical Division. The responsibilities of the Steamship Inspection Division include inspection and certification of ships under the Canada Shipping Act and the Arctic Waters Pollution Prevention Act. This Division also deals with ship safety and pollution matters arising from ship operations, and the application of the Arctic Shipping Pollution Prevention Regulations.

The Nautical Division deals with marine personnel, operational and navigation safety matters. At least 60 days notice is required by this Division when drilling operations are planned for areas lying in or near charted ship routes so any necessary authority may be issued.

Further information and assistance may be obtained from:

Director,  
Ship Safety Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario K1A 0N7  
Name: D.L. Findlay  
Phone: (613) 992-8892

### **Canadian Coast Guard Emergencies**

This office is responsible for the marine contingency planning function of the Department of Transport and also supplies co-ordination and assistance when a federal response is made to combat a spill of oil or toxic materials into the marine environment. The response is made under the National Marine Emergency Plan or in the case of international boundary waters, the appropriate Joint International Plan.

Further information and assistance may be obtained from:

Coast Guard Emergencies,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario K1A 0N7  
Name: Capt. M.S. Greenham  
Phone: (613) 992-9743 or 992-9210

### **Coast Guard Casualty Investigations**

This office is responsible for marine accidents investigations, enquiries, and wrecks.

Further information and assistance may be obtained from:

Chief,  
Coast Guard Casualty Investigations,  
Canadian Coast Guard, Transport Canada,  
OTTAWA, Ontario K1A 0N7  
Name: Capt. W.A.W. Catinus  
Phone: (613) 992-4930 or 996-3808

### **Department of Communications**

The responsibilities of this agency include the development of technical standards, the selection and co-ordination of radio frequencies, and the licensing of all classes of radio station except broadcasting.

An operator contemplating the use of radio-communications in his offshore activities should make application for licensing of any radio station in Canada or on board any Canadian vessel involved at least six weeks before the proposed in-service date of the communication facility. Details as to the licensing requirements and the necessary application forms may be obtained from the following addresses:

In Ottawa:  
Director,  
Operations Branch,  
Telecommunication Regulatory Service,  
Department of Communications,  
300 Slater Street,  
OTTAWA, Ontario K1A 0C8  
Phone: (613) 992-9642

Companies in Western Canada may contact:

Regional Director,  
Pacific Region,  
Department of Communications,  
325 Granville Street, Room 300,  
VANCOUVER, B.C. V6C 1S5  
Phone: (604) 666-1469

Regional Director,  
Central Region,  
Department of Communications,  
2300 - One Lombard Place,  
WINNIPEG, Manitoba R3B 2Z8  
Phone: (204) 985-4081

District Manager,  
Department of Communications,  
205 - 8th Avenue, S.E., Room 803, 805,  
CALGARY, Alberta T2G 0K9  
Phone: (403) 231-4203

District Manager,  
Department of Communications,  
400 Baker Center,  
10025 - 106th Street,  
EDMONTON, Alberta T5J 1G6  
Phone: (403) 425-5614

District Manager,  
Department of Communications,  
202 - 11117 - 100 Street,  
GRANDE PRAIRIE, Alberta T8V 2N2  
Phone: (403) 532-3533

Companies in Northern Canada may contact:  
District Manager,  
Department of Communications,  
P.O. Box 540,  
FORT SMITH, N.W.T. X0E 0P0  
Phone: (403) 872-2187

District Manager,  
Department of Communications,  
Polaris Building,  
201 - 4133 - 4th Avenue,  
WHITEHORSE, Y.T. Y1A 1H8  
Phone: (403) 667-5102

District Manager,  
Department of Communications,  
P.O. Box 2700,  
YELLOWKNIFE, N.W.T. X0E 1H0  
Phone: (403) 873-3568

Companies in Central Canada (Ontario/Quebec) may contact:  
Regional Director,  
Ontario Region,  
Department of Communications,  
9th Floor, 55 St. Clair Avenue East,  
TORONTO, Ontario M4T 1M2  
Phone: (416) 996-6280

Regional Director,  
Quebec Region,  
Department of Communications,  
20th Floor, 2085 Union Street,  
MONTREAL, Quebec H3A 2C3  
Phone: (514) 283-7994

Companies in Eastern Canada may contact:  
Regional Director,  
Department of Communications,  
7th Floor, Terminal Plaza Building,  
1222 Main Street,  
MONCTON, N.B. E1C 8P9  
Phone: (506) 858-2396

#### **National Research Council of Canada**

##### ***Space Research Facilities Branch***

Operators planning offshore activities in the Hudson Bay region must inform the following agency of the National Research Council well in advance since rockets are fired on a year round basis from the Churchill Research Range:

Head,  
Operations,  
Space Research Facilities Branch,  
National Research Council of Canada,  
OTTAWA, Ontario K1A 0R6  
Name: J.A. Tarzwell  
Phone: (613) 993-9385

Operators active in the Hudson Bay region are also required to co-ordinate their field activities with:

Officer-in-Charge,  
Space Research Facility,  
National Research Council of Canada,  
GIMLI Industrial Park,  
GIMLI, Manitoba R0C 1B0  
Name: D. Gray  
Phone: (204) 642-5424

Rockets are also launched from time to time from the facilities at Resolute Bay, N.W.T. and Cape Perry, N.W.T. Operators with exploration work planned for this vicinity are urged to co-ordinate their activities with the National Research Council, Ottawa.

**Department of National Revenue  
Customs and Excise**

The Headquarters Operations Directorate administers that portion of the Canada Shipping Act that relates to the coastal trade. In this connection, any company importing ships or specialized plants and equipment for exploration work on Canada's sea-coasts and among the Arctic Islands may obtain information, assistance and such other contacts as may be necessary in Customs and Excises from:

Director General,  
International Traffic Programs Division,  
Revenue Canada,  
Customs & Excise,  
OTTAWA, Ontario  
K1A 0L5

Name: E.D. Warren  
Phone: (613) 992-0693

**Canada Employment and Immigration Commission**

***Canada Immigration Division***

Director,  
Policy Liaison,  
Recruitment and Selection Branch,  
Canada Employment & Immigration Commission,  
OTTAWA, Ontario  
Name: W.R. Lundy  
Phone: (613) 995-3497

The Winnipeg and Edmonton offices of the Canada Employment and Immigration Commission can answer any queries regarding entry into the Northwest Territories. The Vancouver office can respond to queries for entry into the Yukon Territory.

At Tuktoyaktuk, a local R.C.M.P. officer is also a representative for Employment and Immigration and can clear entry into Canada via Tuktoyaktuk.

At Inuvik, the Customs Officer is also Commission representative for Employment and Immigration and can be contacted by telephone if prior arrangements are necessary. There is no representative in Aklavik; in the event that a seismic crew prefers to land at Aklavik, arrangements must be made with the Inuvik representative.



# Appendix II

To all Permittees and Lessees

## ***Expenditures Relating to Processing and Interpretation of Geophysical Data Acquired on Canada Lands***

"An information letter was distributed to all Permittees and Lessees advising operators that as from January 1, 1974, expenditures incurred in computer processing and the interpretation of Geophysical Data acquired in the course of exploration activities involving Canada Lands will not be considered eligible for approval as allowable expenditures unless such processing and interpretation has been carried out in Canada.

After January 1, 1974, an operator submitting, a claim, pursuant to the *Canada Oil and Gas Land Regulations*, for allowing expenditures involving geophysical operations undertaken on Canada Lands must identify on his statement of expenditures the name of the company or companies involved together with the location of: (a) the computer facilities utilized in the processing of the geophysical data; and (b) the offices wherein interpretation of the geophysical data was undertaken. Expenditures incurred for computer processing must be separately identified and not included as part of the costs incurred for interpretation.

Further in this regard, the processing of geophysical data undertaken on board non-Canadian seismic ships will be considered to be work undertaken outside Canada and not eligible for approval as allowable expenditures.

Director,  
Northern Non-Renewable Resources Branch,  
Department of Indian Affairs and Northern Development."

## ***Transfer of Interest - Canada Lands***

"*The Canada Oil and Gas Land Regulations* stipulate that no transfer of an oil and gas permit or lease shall pass any interest in a permit or lease until the transfer is registered in accordance with the Regulations, which registration must be approved by the Chief. Please be advised that one of the considerations for the approval of the registration of a transfer of any interest in a permit or lease will be that all agreements or an executive summary relating to such transfer of interest have been deposited with the Chief.

All permittees are requested, therefore, to arrange to forward a copy of each current agreement, or an executive summary, to the federal agency concerned at their earliest convenience. In future such agreements should be deposited with the Chief of the appropriate federal agency at the time they are made.

The confidentiality of documents relating to these agreements will of course be maintained until permission to release them is given by the Companies involved.

Director,  
Northern Non-Renewable Resources Branch."

## ***Importation and Operation of Foreign Vessels***

"The importation and operation of vessels coastwise or between Canadian and foreign ports are subject to the Customs Act, the Canada Shipping Act, and Coastwise and Foreign Shipping Regulations and the Customs Tariff. These acts and regulations, Inter Alia, are administered by the Customs Programs Branch of the Department of National Revenue.

A company wishing to import ships or specialized plant and equipment for exploration work off Canada's seacoasts is requested to make application well in advance of the proposed commencement date of any programme. In order to ensure that the application is processed properly, this department should be advised at least ninety days before the commencement of the programme. This lead time of ninety days is needed to determine the suitability of Canadian-flag vessels declared available to fulfill the purposes respecting which temporary entry is sought.

Each application must state the area of operation and the approximate time span, and contain a description of the salient features of the energy source equipment proposed for the particular operation. Information should also be supplied in respect of all other essential criteria required, including bunker and stores capacity, accommodation, clear deck space, size of instrumentation room, electrical energy additional to vessel's normal operation needs and possible draft restrictions.

Any additional information, assistance and other contacts as may be necessary in Customs and Excise may be obtained from:

Director,  
Transportation Programs Directorate,  
Department of National Revenue,  
Customs and Excise,  
OTTAWA, Ontario  
K1A 0L5  
Phone: (613) 992-1900"

**To:** All Permittees and Lessees  
All Oil and Gas Operators  
Canadian Petroleum Association  
Independent Petroleum Association of Canada  
Canadian Association of Oil Well Drilling  
Contractors

### **Metric Conversion**

The Metric Conversion Plan Sector 4.02, as approved by the Metric Conversion and the Petroleum and Natural Gas Industry, requires that the Industry become operational in SI commencing 79-01-01. In order to assist the process of orderly conversion to SI units, resource management agencies of EMR and DINA are prepared to accept all technical and drilling reports in SI units as of the date of this letter. Imperial and American units may also be used during the next few months, but all reports will have to be in SI by the first day of next year.

The Departments wish to advise that drilling authorities and other reporting forms will be issued in SI units as of 79-01-01, and that departmental data will be compiled only in these units after that date. Please consult the 3rd Edition of the Supplementary Metric Practice Guide for the correct usage of terms and abbreviations. This publication is available from the Canadian Petroleum Association in Calgary.

The following table indicates the appropriate units and sensitivities that the Departments will require for various drilling and production data.

<i>Item</i>	<i>Reporting SI unit</i>	<i>Required Sensitivity</i>
Hole size	mm	10 mm (tens of units)
Pressure	kPa	10 kPa (tens of units)
Casing diameters	mm	1 mm (units)
Density	kg/m <sup>3</sup>	1 kg/m <sup>3</sup> (units)
Lease & Permit areas	ha	1 ha (units)
Volume for water, oil and other liquids (15°C)	m <sup>3</sup>	0.1 m <sup>3</sup> (tenths)
Gas volumes (15°C and 101.325 kPa)	10 <sup>3</sup> m <sup>3</sup>	0.1 10 <sup>3</sup> m <sup>3</sup> (tenths)
Depths & short distances	m	0.1 m (tenths)
Distances	km	0.1 km (tenths)
Oil royalty calculations	m <sup>3</sup>	0.01 m <sup>3</sup> (hundredths)
Amount of cement	t	0.01 t (hundredths)

Any questions regarding these matters may be referred to Mr. S.A. Kanik, Northern Program Metric Co-ordinator at 613-997-9444, and to Mr. F. Lepine, RMCB Metric Co-ordinator at 613-995-9351.

# Appendix III

## Reporting Forms

The Northern Non-Renewable Resources Branch is a member of the "Federal Provincial Committee on Energy Statistics" and the "Mines Ministers Subcommittee on Oil and Gas Statistics" and together with the four western provinces and Statistics Canada has standardized all its oil and gas reporting forms. This standardization has removed duplication between government agencies and more important, industry can now process all oil and gas reporting forms from the western provinces and the Yukon and Northwest Territories on electronic data processing equipment without change of programs.

<b>Form No.</b>	<b>Title of Form</b>
IAN*52-90-1**	Application for a Drilling Authority
IAN*52-90-2	Well Completion Data
IAN*52-90-3**	Application to Amend a Drilling Authority
IAN*52-90-4**	Application to Change a Well Name
IAN*52-90-5**	Application to Abandon a Well or Suspend Drilling
IAN*52-90-6**	Application to Alter Condition of a Well
IAN*52-90-7	Work-over Report No.
IAN*52-90-8	Application to Commingle Production before Measurement
IAN*52-90-9	Data for Back Pressure Test on Natural Gas Wells-Monograph 7 Method
IAN*52-90-10	Data for Back Pressure Test on Natural Gas Wells-Vitter's Method
IAN*52-90-11	M.P.R. – Oil Calculations
IAN*52-90-12	New Oil Well Report
IAN*52-90-13	New Gas Well Report
IAN*52-90-17	New Service Well Report
IAN*52-90-18	Monthly Water Flood Operations Report
IAN*52-90-20	Monthly Water Receipts and Disposal of Fluids Report
IAN*52-90-23	Geologic Surface Survey & Airphoto Analysis – Expenditures
IAN*52-90-24	Land Geophysical Operations – Expenditures
IAN*52-90-25	Marine Geophysical Programs – Expenditures
IAN*52-90-26	Drilling & Structure Test Drilling Expenditures

IAN*52-90-27	Participation Programs – Expenditures
IAN*52-90-28	Geophysical – Seismic, Aeromagnetometer, Gravity Survey
IAN*52-90-29	Research Program, Environmental Studies
IAN*52-90-30	Geological Surveys, Photogeological, Mapping and Analyses
IAN*52-91**	Notice of Commencement of Exploratory Work
IAN*52-91-1**	Notice of Commencement of Research and Development Work
IAN*52-92	Application for Authority to Drill Structure Test Hole
IAN*52-93	Report on Abandonment of Structure Test Hole
IAN*52-83	Grouping Notice
IAN*52-103*	Application for Oil and Gas Lease
IAN*51-183	Monthly Accident Summary

\* To be completed by Operator

\*\* To be completed in triplicate; all other forms to be completed in duplicate.

All forms, except IAN 52-83, IAN 52-90-23 to IAN 52-90-27, IAN 52-91, IAN 52-91-1, and 51-103, are submitted to the appropriate District Oil and Gas Conservation Engineer.

Forms IAN 52-83, 52-90-23 to 52-90-27 and 52-103 are submitted to the Northern Non-Renewable Resources Branch, Ottawa, Ontario K1A 0H4.

Forms IAN 52-91 and 52-91-1 should be submitted to the Oil and Gas Exploratory Operations Section – 112-11th Avenue S.E., Calgary, Alberta T2G 0X5.

The following forms have been issued pursuant to the Canada Oil and Gas Land Regulations and Canada Oil and Gas Drilling and Production Regulations. These forms are to be completed when applicable during the production stage of oil and gas wells, and refinery operations.



<b>Form No.</b>	<b>Title of Form</b>
IAN 52-116-1	Monthly Production Report
IAN 52-116-2	Monthly Disposition and Crown Royalty Statement
IAN 52-116-3	Monthly Gas Gathering Statement
DBS 6511-38*	Monthly Oil Pipeline Gathering Operations Statement
IAN 52-116-5	Monthly Crude Oil and Condensate Purchaser's Statement
IAN 52-116-6	Monthly Gas Plant Statement
DBS 6511-37*	Monthly Natural Gas Distributors Statement
IAN 52-116-8	Monthly Gas Processing Plant Products Statement
IAN 52-116-9	Monthly Liquefied Petroleum Gas Purchaser's Statement
IAN 52-116-10	Monthly Refinery Operations Report
IAN 52-116-11	Monthly Gas Injection Operations Report
IAN 52-116-12	Statement of Nomination and Estimated Requirement of Crude Oil, Condensate and Pentanes Plus
IAN 52-116-13	Monthly Sulphur Plant Operations Report

**Notes:**

- (a) All forms to be completed by Operator.
- (b) Forms 6511-37 and 6511-38 are completed by the Operator in triplicate.

The first two copies are to be forwarded to the Northern Non-Renewable Resources Branch in Ottawa, and the third to the District Oil and Gas Conservation Engineer responsible for the District in which the well is located (see Fig. 20).

The other forms listed above are completed in duplicate. The original is submitted to the Northern Non-Renewable Resources Branch in Ottawa and one copy to the appropriate District Oil and Gas Conservation Engineer.

All the above forms will be converted to SI units and will be distributed to industry in 1978. The use of SI units will become mandatory as of January 1, 1979.

# Appendix IV

## Summaries of the Geological Provinces

### **1 Arctic Stable Platform**

The Arctic Stable Platform lies between the Precambrian Shield to the South and the Franklinian geosyncline to the north and west. The area is underlain by thin, gently dipping, relatively undisturbed Lower Paleozoic carbonates that overlie the craton and thicken northward from the Shield. The Platform is divided into several individual basins, Foxe Basin being the one farthest to the east.

### **2 Franklinian Geosyncline (Arctic Fold Belt)**

The limits of Paleozoic deformation define the division between the Franklinian Geosyncline and the Arctic Stable Platform to the south and east. The area was the site of continuous sedimentation from Cambrian to Upper Devonian time. Two depositional belts are recognized; a miogeosynclinal belt extending from Banks Island to northern Greenland, and a eugeosynclinal belt exposed only on Axel Heiberg and Ellesmere Islands. Thick carbonates and clastics constitute potential reservoirs. Strata were folded in the Ellesmerian orogeny of Late Devonian or Early Carboniferous time and these folded strata also constitute the "basement" underlying the Sverdrup Basin.

### **3 Sverdrup Basin**

A major angular unconformity marks the base of the Sverdrup Basin, a successor basin with a stratigraphic sequence of Lower Pennsylvanian to Tertiary strata overlying the folded Paleozoic rocks of the Franklinian Geosyncline. The structural and depositional axis of the Sverdrup Basin strikes northeast from Banks Island to northern Ellesmere Island. The thickness of sediments in the basin is in excess of 7 600 m along this axis. The sediments, which are interrupted by a number of unconformities, thin from the axis to form an elongate basin. Sediment thickness and facies indicate that the present south and east limits of the basin are close to the original depositional limits. Tertiary strata of the Arctic Coastal Plain overlap the northern and western margins. Evaporites of late Paleozoic age form piercement structures in the axial zone. Upper Cretaceous and older sediments are intruded by igneous sills and dykes of varying thickness, mostly in the

eastern half of the basin. The Eurekan Orogeny, in late Cretaceous and early Tertiary time, produced folding and faulting throughout the basin; deformation was accompanied by emplacement or reactivation of piercement bodies. Intensity of deformation increases towards the northeast margin of the basin. Thick, sandy sequences of Jurassic and Triassic age contain the major hydrocarbon reserves.

### **4 Arctic Coastal Plain**

The north and west margins of the Sverdrup Basin, both on land and offshore, are covered by thick relatively undisturbed Tertiary and Pleistocene clastics. Beds dip gently toward, and thicken on, the continental shelf and slope. In this area the continental shelf is approximately 160 km wide. The shelf offshore from the Mackenzie Delta is termed the Beaufort Sea. The continental slope is defined as between 600 and 3 000 m water depth\*. The deep Arctic Ocean, termed the Canada Basin, forms an abyssal plain seaward of the slope. The Tertiary and Mesozoic are considered to have the best offshore potential for oil and gas. Permanent ice cover and a short drilling season have hindered or made costly drilling in the offshore regions.

### **5 Baffin Bay/Davis Strait Basin**

The Baffin Bay/Davis Strait Basin lies entirely offshore and has been explored to date only by regional geophysical surveys. Several theories to explain the origin of the basin have been advanced: a widely accepted one involves continental drift by which Greenland and the Baffin land mass spread apart about a pivot point located somewhere to the northwest. Geophysical surveys have demonstrated that the basin is underlain by an oceanic crust, that there is no mid-basin ridge, and that as much as 7 600 m of sediment cover the floor. Sediments thin to zero in nearshore areas and over the Davis Strait Sill. Rocks cropping out around the basin margins are predominantly Precambrian. Major centres of deposition are the Thule Basin off Greenland, the Lancaster Delta, the Home Bay Delta and the Cumberland Delta. Lancaster Sound and Jones Sound are structurally controlled grabens in which thick deltaic clastics accumulated. A major Tertiary drainage system transported sediment to the basin from a sediment source area to the west. The large volume of geologically young sediments and the presence of favourable trapping conditions for hydrocarbon give the Baffin Bay/Davis Strait area a high hydrocarbon potential.

## **6 Banks Basin**

The Banks Basin occupies the central and west-central part of Banks Island and the adjacent coastal plains. Tertiary and Cretaceous clastics overlie mainly Lower and Middle Devonian sediments over much of the area. Proterozoic rocks of the Minto Arch occur at the southernmost tip. The sediments of the Banks Basin have been sparsely drilled and the presence of thick Tertiary and Mesozoic sediments and the reefal facies of the Devonian-Silurian carbonates give the area a moderate potential for hydrocarbon accumulations.

## **7 Mackenzie-Beaufort Basin**

The Mackenzie Delta/Beaufort Sea petroleum province is made up of a thick section containing productive Cretaceous and Tertiary sands. The Mackenzie Delta, the southern portion of the Mackenzie-Beaufort Basin, is bounded by the Romanzof uplift to the southwest, the Richardson Mountains to the south, the Eskimo Lakes Arch to the southeast and the Arctic Ocean to the north. The Beaufort Sea is one of several marginal embayments that occur as indentations in the coastline of the Arctic Ocean. The Coastal Plain, which lies adjacent to the Beaufort Sea, is laterally continuous with the continental shelf and is considered as the onshore, exposed extensions of the Beaufort Sea shelf. The Beaufort Sea petroleum province is contiguous with the Yukon and Mackenzie Coastal Plains, and the Banks Coastal Plain.

Growth faults extend seaward from the Mackenzie Delta across the coastal plain. Shale diapirs form large, mostly offshore structures. Potential reservoir rocks, which include deltaic and marine sandstone are interbedded and continuous with organic-rich shales.

## **8 Interior Plains**

a) *Great Slave Plain* – The Great Slave Plain encompasses an area extending westward from Great Slave Lake to the Liard Plateau and Mackenzie Mountains. Underlying strata are mainly of Devonian age, covered in part by remnants of a thick Cretaceous sequence. The total thickness of sediment ranges from zero in the east to more than 3 000 m in the west. Gas reservoirs are found in porous dolomites and limestones of Middle Devonian age.

b) *Great Bear Plain* – The Great Bear Plain consists of Lower and Upper Cretaceous sediments partially on a bedrock of Ordovician to Devonian age. The total thickness of the sediments wedges from zero in the east to more than 1 800 m in the west along the eastern edge of the Franklin Mountains.

c) *Anderson Plain* – The Anderson Plain lies east of the Mackenzie Delta. Cretaceous beds cover much of the Plain and lie unconformably on Lower and Middle Paleozoic beds. Sediments more than 2 400 m thick occur in a southwest-northeast trend through the wells C.P.O.G. Kugaluk N-02 and Elf Horton River G-02. Hydrocarbon shows have been encountered in the Cretaceous deposits.

d) *Mackenzie Plain* – The Mackenzie Plain lies between the Franklin and Mackenzie Mountains. Cretaceous beds lie unconformably on Lower and Middle Paleozoic beds. Sediments range in thickness from 1 200 m to 2 700 m. Oil is produced in the Mackenzie Plain at Norman Wells, from the Devonian Kee Scarp formation. Additional hydrocarbon shows have been encountered in the Cretaceous and Silurian.

e) *Peel Plain* – The Peel Plain lies northeast of the Peel Plateau and northwest of the Mackenzie Plain. It is covered by Cretaceous and Jurassic sediments which overlie Paleozoic carbonates and shales. The sediments are similar to those of the Mackenzie Plain and range in thickness from more than 4 200 m in the southwest to 2 400 m in the northeast. Hydrocarbon shows have been encountered in the Lower Devonian.



### **9 Liard Plateau and Range**

The Liard Plateau and Range lie west of the southern portion of the Great Slave Plain and northwest of the Fort Nelson Lowland.

A thin Cretaceous cover lies unconformably on Paleozoic beds. The Beaver River and Pointed Mountain fields produce or have produced gas from thrust-dolomites of the Nahanni formation of Middle Devonian Age. Current production in the Beaver River field in the Yukon is from large faulted anticlines containing Mississippian sands.

### **10 Eagle Plain**

The Eagle Plain basin is contained between the Ogilvie and Richardson Mountains. Sediments approach 6 100 m in thickness, of which about 3 000 m are late Paleozoic to Mesozoic in age, the remainder being Cenozoic. The basin has been tectonically deformed. Hydrocarbon shows have been encountered in Mississippian, Devonian and Ordovician beds.

### **11 Peel Plateau**

The Peel Plateau is bounded on the northwest and the east by the Peel Plateau Plain, on the south by the Mackenzie Mountains, and on the west by the Richardson Mountains. The Plateau is covered by Tertiary and Cretaceous clastics unconformably overlying Paleozoic shales and carbonates. The sediments range in thickness from 3 000 m in the east to 6 100 m in the west. Shows of hydrocarbons have been encountered in Cretaceous and Middle Devonian strata.

### **12 Old Crow Basin**

The Old Crow Basin is a relatively unexplored intermontaine basin covering an area of about 6 200 km<sup>2</sup> centered at about latitude 68°N and longitude 140°W. Geophysical data indicate a thickness of from 500 to 1 500 m of Mesozoic and Tertiary clastics overlying as much as 3 000 m of Upper Devonian to Permo-Carboniferous sediments. The Old Crow Basin as it now exists was formed by the Laramide orogeny in Tertiary time.

### **13 Whitehorse Basin**

The Whitehorse Basin lies at the northern end of the Central Cordilleran Geosyncline. It is about 240 km long and 110 km wide and contains up to 4 600 m of sediments ranging in age from early Cretaceous to Late Triassic.

A selected bibliography to the geology of the Yukon and Northwest Territories is provided in Appendix V.

# Appendix V

## Selected Bibliography

A wide variety of reports and papers applicable to geological provinces or basins in northern Canada are available, a majority are Geological Survey of Canada (GSC) publications or in proceedings and memoirs of various Societies. A listing of all GSC reports may be found in Index to Publications 1959 – 1974 by P.J. Griffen, published by the GSC in 1976. The following is a list of the more important of these papers.

- 1 Aitken, J.D., and Glassm D.J. (Editors)  
1973: GAC – CSPG proceedings of the Symposium on the Geology of the Canadian Arctic.
- 2 Yorath, C.J., Parker, E.R. and Glass, D.J. (Editors)  
1975: Canada's Continental Margins and Offshore Petroleum Exploration; C.S.P.G. Memoir 4, Canadian Society of Petroleum Geologists.
- 3 McCrossan, R.G. (Editor)  
1973: Future Petroleum Provinces of Canada; C.S.P.G. Memoir 1, Canadian Society of Petroleum Geologists.
- 4 Wren, A.E. and Cruz R.B. (Editors)  
1974: Proceedings of the 1973 National Convention; Canadian Society of Exploration Geophysicists.

For a complete list of oil industry technical reports released from confidential status, the reader should refer to the Departmental publication *Technical Reports Available for Inspection – 1976*.

Important references not found in the preceding publications are listed below.

### *Northwest Territories – Mainland*

- 1 Bily, C. and Dick, J.W.C.  
1974: Naturally occurring gas hydrates in the Mackenzie Delta, N.W.T.; Bulletin of Can. Pet. Geol., Vol. 22, No. 3, pp. 340-353.
- 2 Cote, R.P., Rector, R., Lerand, M.  
1974: Gulf describes Geology of the Parsons Lake Gas find, Can. Pet. – April, pp. 72-78.
- 3 Crickmay, C.H.  
1970: Ramparts, Beavertail and other Devonian Formations; Bull. Can. Pet. Geol., Vol. 19, No. 1, pp. 67-79.
- 4 Law, J.  
1971: Regional Devonian Geology and Oil and Gas Possibilities, Upper Mackenzie River Area; Bull. Can. Pet. Geol., Vol. 19, No. 2, pp. 437-484.
- 5 Meijer-Drees, N.C.  
1975: Geology of the Lower Paleozoic Formations in the Subsurface of the Fort Simpson Area, District of Mackenzie, G.S.C. paper 74-40.
- 6 Smith, M.W.  
1976: Permafrost in the Mackenzie Delta; G.S.C. paper 75-28.
- 7 Vopni, L.K., and Lerbekmo J.F.  
1972: The Horn Plateau Formation: A Middle Devonian Coral Reef Northwest Territories; Bull. Can. Pet. Geol., Vol. 20, No. 3, pp. 498-548.
- 8 Young, F.G.  
1975: Upper Cretaceous Stratigraphy, Yukon Coastal Plain and Northwestern MacKenzie Delta: G.S.C. Bull. 249.

### ***Eagle Plain and Northern Yukon***

- 1 Bamber, E.W. and Waterhouse, J.B.  
1971: Carboniferous and Permian Stratigraphy and Paleontology, Northern Yukon Territory; Bull. Can. Pet. Geol., Vol. 19, No. 1, pp. 29-249.
- 2 Lenz, A.C.  
1972: Ordovician to Devonian History of Northern Yukon and adjacent District of MacKenzie; Bull. Can. Pet. Geol., Vol. 20, No. 2, pp. 321-361
- 3 Miall, A.D.  
1973: Regional Geology of Northern Yukon; Bull. Can. Pet. Geol., Vol. 21, No. 1, pp. 81-116.
- 4 Norris, A.W.  
1967: Devonian and Northern Yukon Territory and adjacent District of MacKenzie, Inter. Sym. on Dev. System, A.S.P.G.

### ***Arctic Islands***

- 1 Frebold, H.  
1975: Jurassic Faunas of the Canadian Arctic; G.S.C., Bull. 243.
- 2 Klovan, J.E. and Embry, A.F. III  
1971: Upper Devonian Stratigraphy, Northeastern Banks Island; Bull. Can. Pet. Geol., Vol. 19, No. 4, pp. 705-729.
- 3 Plauchut, B.P.  
1971: Geology of the Sverdrup Basin; Bull. Can. Pet. Geol., Vol. 19, No. 3, pp. 659-679.
- 4 Plauchut, B.P. and Jutard, G.G.  
1976: Cretaceous and Tertiary Stratigraphy, Banks and Eglinton Islands and Anderson Plains; Bull. Can. Pet. Geol., Vol. 24, No. 3, pp. 321-371.
- 5 Snowdon, L.R. and Roy, K.J.  
1975: Regional Organic Metamorphism in the Mesozoic Strata of the Sverdrup Basin; Bull. Can. Pet. Geol., Vol. 23, No. 1, pp. 131-172.
- 6 Stuart-Smith, J.H. and Wennekers, J.H.N.  
1977: Geology and Hydrocarbon Discoveries of Canadian Arctic Islands; AAPG Bull., Vol. 61, No. 1, pp. 1-28.

### ***Arctic Coastal Plain and Continental Shelf***

- 1 Sobczak, L.W.  
1975: Gravity and Deep Structure of the Continental Margin of Banks Island and MacKenzie Delta; Can. Jour. Earth Sc. Vol. 12, pp. 248-395.

### ***Hudson's Bay Basin and Lowlands***

- 1 Stanford B.V. and Norris, A.W.  
1975: Devonian Stratigraphy of the Hudson Platform: Part I, Stratigraphy and Economic Geology, G.S.C. Memoir 379.

### ***Foxe Basin and Baffin Bay***

- 1 Keen, C.E. et al.  
1972: Geophysical Studies in Baffin Bay and some Tectonic Implications; Can. J. Earth Sc. Vol. 9, No. 3.
- 2 Keen, C.E. and Barrett D.L.  
1973: Structural Characteristics of Some Sedimentary Basins in Northern Baffin Bay; Can. J. Earth Sc. Vol. 10, No. 7, pp. 1267-1278.
- 3 Trettin, H.P.  
1975: Investigations of Lower Paleozoic Geology, Foxe Basin, Northeastern Melville Peninsula and parts of Northwestern and central Baffin Island; G.S.C., Bulletin 251.











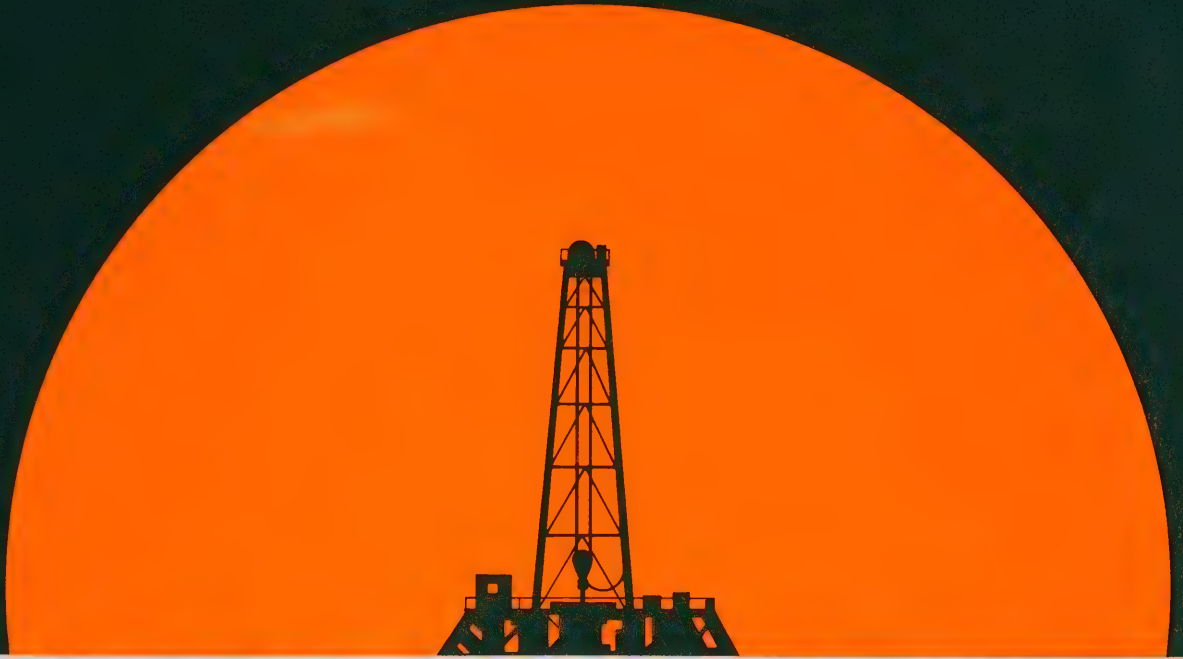


Indian and Northern  
Affairs Canada

Affaires indiennes  
et du Nord Canada

# Oil and Gas Activities 1979

CA1  
IA 61  
-  $\phi 32$





# Oil and Gas Activities 1979

(Edition No. 16)

## **Report on the Activities in 1979 of the Oil and Gas Industry in the Yukon Territory and Northwest Territories**

Compiled by Oil and Gas Exploratory Operations  
Section  
Northern Non-Renewable Resources Branch

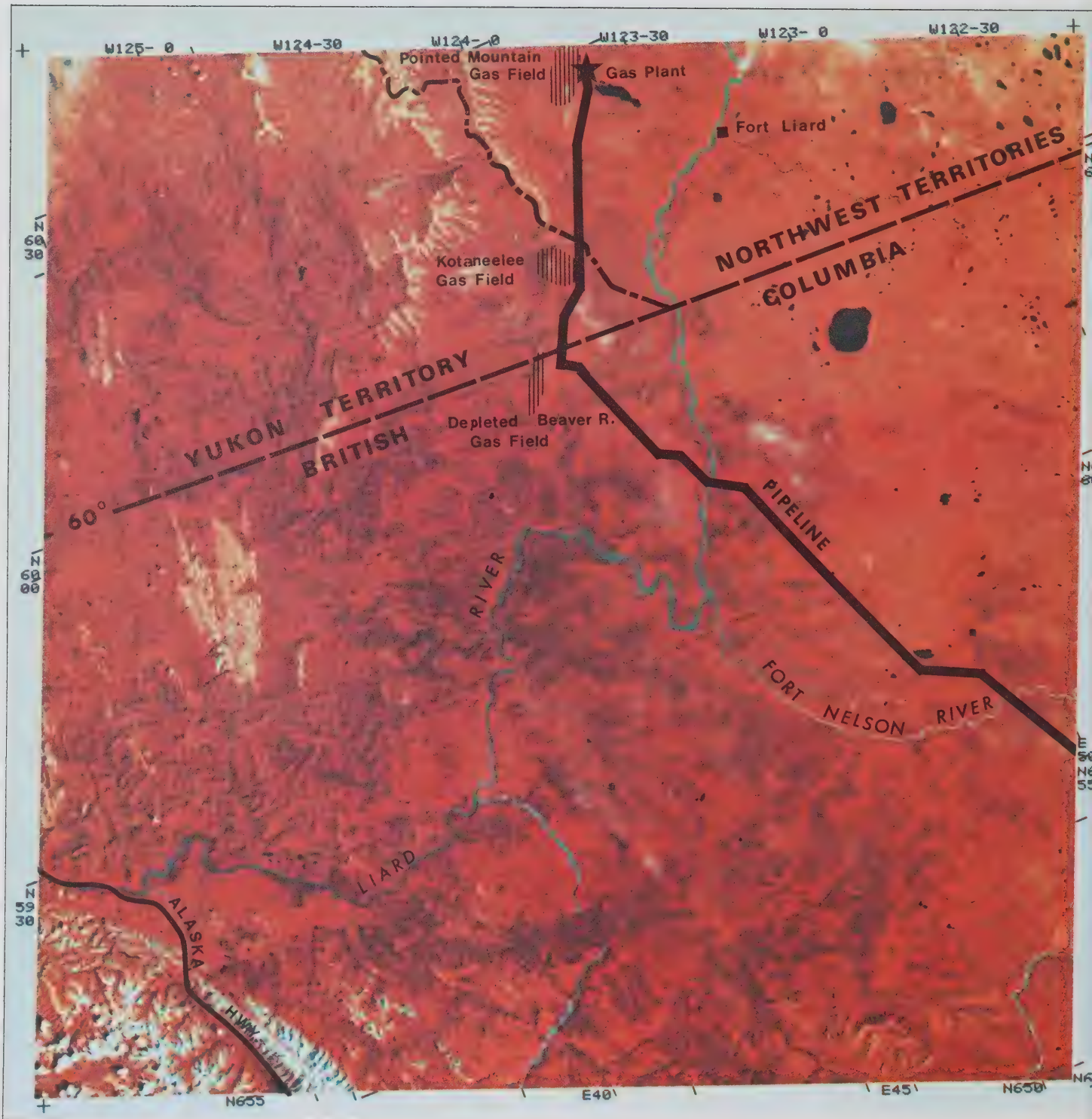
© Published under authority of the  
Hon. John C. Munro, P.C., M.P.,  
Minister of Indian Affairs and Northern Development,  
Ottawa, 1980  
QS-8265-000-EE-A1  
Catalogue No. R71-6/1979E  
ISBN 0-662-11100-1

Cette publication peut aussi être obtenue en français





False-Colour Infrared Satellite Photograph of the Kotaneelee and Pointed Mountain Gas Fields, Yukon-Northwest Territories and British Columbia Region



# Table of Contents

<b>6</b>	<b>Preface</b>	<b>53</b>	<b>Production, Processing and Refining</b>
<b>7</b>	<b>Summary</b>	53	Norman Wells Oil Field
<b>9</b>	<b>Introduction</b>	53	Pointed Mountain Gas Field
<b>11</b>	<b>Oil and Gas Discoveries and Reserves</b>	53	Beaver River Gas Field
12	Geological Provinces North of 60° – Oil and Gas Discoveries and Recoveries	54	Kotanelee Gas Field
18	Report of the Reserves Committee of the Canadian Petroleum Association – 1979	<b>55</b>	<b>Pipelines and Development Projects</b>
20	Summary of Oil and Natural Gas Resources	55	Alaska Highway Gas Pipeline Project
<b>21</b>	<b>Land Administration</b>	56	Dempster Lateral Gas Pipeline
<b>24</b>	<b>Acts and Regulations</b>	58	Polar Gas Project
24	Canada Oil and Gas Land Regulations	58	Petro-Canada Arctic Liquefied Natural Gas (LNG) Pilot Project
25	Canada Oil and Gas Geophysical Regulations	59	Norman Wells Pipeline
25	Canada Oil and Gas Pipeline Regulations	<b>60</b>	<b>Surveys and Studies</b>
25	Canada Oil and Gas Production Regulations	60	Geophysical Surveys
25	Canada Oil and Gas Drilling Regulations	60	Research Programs
29	Land Use Regulations	60	Eastern Arctic Marine Environmental Studies
29	Metrication in the Oil and Gas Industry	62	Lancaster Sound Regional Study
<b>30</b>	<b>Revenues</b>	<b>63</b>	<b>Appendix I</b>
<b>36</b>	<b>Exploration, Discoveries and Drilling Operations</b>		Sources of Information
36	Exploration	<b>80</b>	<b>Appendix II</b>
36	<i>Geological and Geophysical Surveys</i>		Directives
36	<i>Land Seismic Surveys</i>	<b>82</b>	<b>Appendix III</b>
36	<i>Marine Seismic Surveys</i>		Reporting Forms
36	Discoveries	<b>84</b>	<b>Appendix IV</b>
36	Drilling		Summaries of the Geological Provinces
40	<i>Offshore</i>	<b>87</b>	<b>Appendix V</b>
40	<i>Arctic Islands</i>		Selected Bibliography
40	<i>Mainland</i>		
40	<i>Mackenzie Delta</i>		
40	<i>Yukon</i>		
42	1980 Forecast		
<b>50</b>	<b>Net Cash Expenditures by Industry</b>		



# Tables and Illustrations

## Tables

11	Table 1.	Area and Volume of Sediments
19	Table 2.	Canadian Petroleum Association Estimate of Reserves
20	Table 3.	Summary of Oil and Natural Gas Resources – 1975
21	Table 4.	Number of Issued Exploration Rights and Leases, with Relevant Extent as of December 31, 1979
32	Table 5.	Gross Revenue, Oil and Gas (Calendar Year)
34	Table 6.	Gross Revenue, Oil and Gas (Fiscal Year)
39	Table 7.	1973-1979 Exploration Survey Statistics
41	Table 8.	Wells Abandoned or Completed in 1979 (drilling statistics)
50	Table 9.	Net Cash Expenditures 1978 (Final)
51	Table 10.	Net Cash Expenditures 1979 (Preliminary)

## Illustrations

		Oil and Gas Fields and Discoveries (map) centrefold
10	Figure 1.	Geological Provinces (map)
22	Figure 2.	Area Held under Oil and Gas Permit
23	Figure 3.	Area under Lease by Year
26	Figure 4.	Permit Terms and Work Requirement Zones
27	Figure 5.	Permit Terms and Deposit Requirements per Acre
28	Figure 6.	Disposal of Oil and Gas Rights (flow diagram)
31	Figure 7.	Gross Revenue – Oil and Gas (Calendar Year)
33	Figure 8.	Gross Revenue – Oil and Gas (Fiscal Year)
35	Figure 9.	Value of Work Bonus Tenders – Oil and Gas
37	Figure 10.	Exploration Activity – geological crew months – land seismic crew months
38	Figure 11.	Exploration Activity – seismic line kilometres
43	Figure 12.	Wells Completed or Abandoned in 1979 Southern Northwest Territories and Yukon Territory (map)
46	Figure 13.	Wells Completed or Abandoned in 1979 Mackenzie Delta – Beaufort Sea (map)
47	Figure 14.	Wells Completed or Abandoned in 1979 Arctic Islands (map)
48	Figure 15.	Wells Drilled
49	Figure 16.	Depths Drilled
52	Figure 17.	Oil and Gas Exploration Expenditures Submitted for Work Credits
57	Figure 18.	Northern Pipelines (map)
61	Figure 19.	Eastern Arctic Marine Environmental Studies (EAMES) Area (map)



## Photographs

	<i>Frontispiece</i>	False-Colour Infrared Satellite Photograph of the Kotaneelee and Pointed Mountain Gas Fields, Yukon-Northwest Territories and British Columbia Region
9	Photo 1.	Icebreaker <i>Canmar Kigoriak</i> in the Beaufort Sea.
25	Photo 2.	The Bristol Aerospace Automatic Weather Station in the Ice of the Beaufort Sea.
30	Photo 3.	Icebreaker <i>Canmar Kigoriak</i> with Supply Ship <i>Canmar Supplier 8</i>
40	Photo 4.	<i>Canmar Explorer IV</i> Drillship on Site in the Beaufort Sea
56	Photo 5.	Esso Issungnak Artificial Island under Construction in the Beaufort Sea.
60	Photo 6.	<i>Canmar Supplier V</i> at Work in the Beaufort Sea.

# Preface

This report covers oil and gas activities north of 60° for the year 1979. All aspects of these operations in the Yukon and Northwest Territories are administered by the Northern Non-Renewable Resources Branch, Department of Indian Affairs and Northern Development. It is the intent of the department to provide for the orderly exploration and exploitation of oil and gas, thereby achieving local benefits to the specific areas involved as well as benefitting the people of Canada in general through the revenues accruing to the Crown.

As of March 1, 1980 the minister and departmental officers responsible for the administration of oil and gas resources in the Northwest Territories, Yukon Territory and the northern offshore areas were:  
Minister – The Honourable John C. Munro  
Deputy Minister – Paul M. Tellier  
Assistant Deputy Minister (Northern Affairs) –  
E.M.R. Cotterill  
Director, Northern Non-Renewable Resources Branch  
– Dr. H.W. Woodward

## **Oil and Gas Lands Division**

Chief – P. Sullivan  
Head, Oil and Gas Rights Section – J.A.S. Barrett  
Head, Production and Royalty Section – Appointment pending

## **Oil and Gas Resource Evaluation Division**

A/Chief – S.A. Kanik  
Head, Oil and Gas Exploratory Operations Section –  
S.A. Kanik

## **Oil and Gas Engineering Division**

Chief – Appointment pending  
Head, Drilling and Completion Engineering Section  
– M.K. El-Defrawy  
Head, Reservoir Engineering Section – D. Boggs  
Head, Pipeline and Transportation Engineering  
Section – T.G. Starr  
Scientific Research and Special Project Co-ordinator  
– I.M. Feldman  
Regional Oil and Gas Conservation Engineer (Yellowknife) – M.D. Thomas  
Oil and Gas Conservation Engineer – D.R. Whitehead

# Summary

Oil and gas exploration and development continued a slower decline during 1979 than in previous years in the region of Canada north of 60°.

Because many permits have matured, the extent of land held under permit north of 60° declined during 1979 by about 15 per cent and permits for approximately 19 million hectares are expected to mature in 1980. As permits have expired, area under lease has increased. More than 8 million hectares, held under expiring permits, have under discretionary authority, had their permit terms extended. This extension involves annually escalating work requirements designed to give an orderly assessment of potential resources. During 1979, some 1400 leases were issued, including 10 leases involving drilling commitments in the southern parts of the Yukon and Northwest Territories.

Petro-Canada, with the preferential right to select Crown reserve areas for exploration, has already selected about 11 million hectares in the offshore waters of the eastern Arctic. Negotiations for exploration agreements in this area are being deferred until discussions have been completed regarding native claims.

Under the amended Canada Oil and Gas Land Regulations (1977) the oil and gas permit is being replaced by an exploration agreement. The amendments introduced a new management regime, intended to stimulate frontier exploration by fiscal and landholding incentives and at the same time to extend government control over drilling development, as well as provide for increased Canadian participation and benefits. By the end of the year, all leases for which application had been received, had been issued.

Due to changes in government during 1979, the proposed Canada Oil and Gas Act did not receive legislative consideration.

The Canada Oil and Gas Geophysical Regulations, which were drafted jointly by the departments of Indian Affairs and Northern Development and Energy, Mines and Resources are in final preparation prior to promulgation.

The Canada Oil and Gas Production Regulations, drafted in 1979, will be submitted to industry for review and comment in 1980. The Canada Oil and Gas Pipeline Regulations are also in final preparation prior to promulgation.

Revenues for the area north of 60° increased during 1979 due mainly to the increase in land rentals from the newly issued leases and the issuance of a single exploration agreement on 770 000 hectares.

Exploration by land seismic surveys continued in the Arctic Islands and exploration by marine seismic surveys was carried out in the Beaufort Sea, the Mackenzie River and the Norman Wells field. Several oil and gas discoveries were recorded in the Beaufort Sea: oil at the Kopanoar M-13 well, oil and gas both at the Nerlerk M-98 well and in the Adgo field, and a gas recovery at the Ukalerk 2C-50 well. Also, there is a good possibility that a hydrocarbon-bearing zone may have been discovered in Davis Strait by Aquitaine Company of Canada Ltd. A significant gas discovery was made by Panarctic Oils Ltd. at the Whitefish location.

Drilling activity north of 60° increased in 1979, with 29 new wells being drilled. The main activity resulted from the further development by Esso Resources Canada Ltd. of the Norman Wells oil field. Dome Petroleum Limited continued drilling in the Beaufort Sea; the arrival of its new icebreaker, and its newly dredged harbour at McKinley Bay, are expected to enable the company to extend its drilling season in the area in 1980. In the Baffin Bay-Davis Strait area, wells were drilled by Esso and Aquitaine. Panarctic, Phillips Petroleum Canada Ltd., and Dome Petroleum continued drilling operations in the Arctic Islands; Paramount Oil and Gas Limited drilled one well in the southern part of the Northwest Territories; and Columbia Gas Development Company of Canada Ltd. drilled one water disposal well in the Kotaneelee gas field in the Yukon.



Estimates of oil and gas reserves in Canada as compiled by the Reserves Committee of the Canadian Petroleum Association showed an increase in gas reserves in 1979 and a slight decrease in reserves of crude oil. Data regarding Canada's potential oil and gas resources prepared by the Department of Energy, Mines and Resources, remained unchanged from 1978.

Production and refining were carried on at Norman Wells as in previous years. Gas from the Pointed Mountain and Kotaneelee fields was processed through the Clarke Lake plant at Fort Nelson, British Columbia. Approval was received in 1979 from the National Energy Board for the export of gas from the Kotaneelee field to the United States, but an import licence permit was denied by the United States government.

Various means are under consideration for the transport of oil and gas from the northern regions. The proposed *Alaska Highway gas pipeline* from Prudhoe Bay with its spur line, the Dempster lateral to transport gas from the Mackenzie Delta, is suspended at the moment but not abandoned. The proponents of the *Polar Gas Project*, which would bring gas from the Arctic Islands by means of land and underwater pipelines, informed the National Energy Board in 1979 that crossing M'Clure Strait now appears technically feasible and that such a spur from the originally proposed line would permit transport of gas from the Mackenzie Delta and the Beaufort Sea as well as from the Arctic Islands. Another proposal under consideration for the transport of gas from the Arctic Islands is to liquefy the gas and bring it south by specially constructed tankers to a terminal in Quebec or the Maritimes for regasification and distribution. A *Norman Wells pipeline* is proposed for the western Northwest Territories to bring crude oil from Norman Wells south to the Alberta pipeline network.

A major assessment program initiated in 1979 was the Lancaster Sound Regional Study. An interdisciplinary group, drawn from federal departments and the government of the Northwest Territories, was set up to study and report on all aspects, including possible problems, to be considered before a drilling authority should be issued for Lancaster Sound. The findings and recommendations are to be completed for release in February 1981.

# Introduction



Icebreaker *Canmar Kigoriak* in the Beaufort Sea.

For Canada as a whole, the oil and gas situation brightened somewhat in 1979 as major oil discoveries were reported off the east coast and in the Arctic. In the frontier regions oil discoveries were reported at the Hibernia well on the east coast and at the Kopanoar M-13 well in the Beaufort Sea. In the Arctic Archipelago, gas was discovered at the Whitefish H-63 well in the offshore area of the Sverdrup Basin. Further drilling and exploration will continue in 1980 to delineate the extent of these pools and determine their potential resources.

Plans were in progress towards developing the Norman Wells oil field to its full capability. This field, on the Mackenzie River, has been producing for many years, but only to the extent necessary to meet the demands of its small, local refinery. It is now proposed that a pipeline be built from Norman Wells to northern Alberta, there to connect with the pipeline network serving southern markets.

The first wells were drilled in the Davis Strait region and there is a good possibility that a hydrocarbon-bearing zone may have been encountered in one well.

The transportation sector also made significant progress in that the *Foothills Alaska Pipeline Project* came closer to fruition and National Energy Board hearings are scheduled to examine the *Petro-Canada Arctic Liquefied Gas (LNG) Project*.



Figure 1  
Geological Provinces

The map illustrates the geological provinces of Canada, showing the distribution of various geological features and basins. Key regions and features include:

- Arctic Region:** Includes the Arctic Archipelago and the Arctic Plain.
- Cordillera Region:** Includes the Selwyn Mts., Ogilvie Mts., and the Cordillera.
- Precambrian Shield:** A large area in the east and south, characterized by Precambrian rocks.
- Basins and Plains:** Numerous basins and plains are labeled, including the Mackenzie Basin, Athabasca Basin, and the Slave River Basin.
- Geological Features:** The map shows various geological features such as the Mackenzie Mountains, Selwyn Mountains, and the Ogilvie Mountains.
- Major Cities:** Major cities like Vancouver, Edmonton, and Ottawa are marked.
- Provinces and Territories:** The outlines of the provinces and territories are shown, with labels for each.



# Oil and Gas Discoveries and Reserves

The area of Canada north of 60° covers approximately 3 800 000 km<sup>2</sup> of which nearly one-third is underlain by sedimentary rocks. A comparison of the area and volume of sediments in the Western Provinces, the Yukon and the Northwest Territories (including the Arctic Islands) is given in Table 1. (North of 60° area and volume are for Canada lands; that is, lands under the jurisdiction of the government of Canada.)

**Table 1 - Area and Volume of Sediments**

<i>Regions</i>	<i>Total Area (km<sup>2</sup>)</i>	<i>Volume of Sediments (km<sup>3</sup>)</i>
Manitoba & Saskatchewan	570 000	688 000
Alberta	582 000	1 390 000
British Columbia	359 000	1 242 000
Yukon & Northwest Territories Mainland*	1 402 000	1 755 000
Arctic Archipelago**	1 670 000	5 314 000
	4 583 000	10 389 000

\* Includes Beaufort Sea area, but excludes all Arctic Stable Platform

\*\* Includes the Arctic Stable Platform and all offshore areas except Beaufort Sea.

For convenient reference, the area north of 60° has been divided into 13 major geological provinces and a number of sub-provinces as shown in Figure 1. More details of these geological provinces are given in Appendix IV, *Summaries of the Geological Provinces*. A short list of relevant references to the geology of the area is given in Appendix V. The discoveries map (at centre fold) shows the locations of all oil and gas fields, including the 1979 discoveries.

The distribution of oil and gas discoveries and recoveries to the end of 1979, and the potential for future discoveries in the various geological provinces, are outlined in the following pages.

## Geological Provinces North of 60° — Oil and Gas Discoveries and Recoveries

(\*indicates discovery/recovery in 1979)

(DST – Drillstem Test; FT-Flow Test; AOF – Absolute Open Flow; CCT – Closed Chamber Test)

<i>Well Name</i>	<i>Location</i>	<i>Well Status</i>	<i>Reserve Status</i>	<i>Horizon</i>	<i>Lithology</i>	<i>Spud Date</i>	<i>Completion Date</i>	<i>Potential</i>
1. Arctic Stable Platform – only four wells have been drilled to date, all unsuccessful.								
2. Franklinian Geosyncline – significant quantities of light gravity crude oil have been recovered from Middle Devonian carbonates on Cameron Island.								
<b>Cameron Island</b>								
Panarctic et al Bent Horn N-72	N-72-76-30-103-30	Potential Oil & Gas Well	Oil Show	Blue Fiord	Carbonate	73-11-24	74-04-06	79.5 m <sup>3</sup> /d test
Panarctic et al Bent Horn F-72A	F-72-76-30-103-30	Potential Oil & Gas Well	Oil Show	Blue Fiord	Carbonate	75-05-21	75-12-19	70.8 m <sup>3</sup> /d oil DST
Panarctic et al W. Bent Horn A-02	A-02-76-30-104-00	Potential Oil & Gas Well	Oil Discovery	Blue Fiord	Carbonate	76-05-06	76-08-01	Max. 1256 m <sup>3</sup> /d production test
3. Sverdrup Basin – nine gas fields have been discovered to date. Recoveries of crude oil have been recorded from Ellesmere and Thor islands.								
<b>Gas Discoveries</b>								
<b>Melville Island</b>								
Panarctic Drake Point N-67	N-67-76-30-108-30	Abandoned	Gas Discovery	Jurassic	Sandstone	69-04-14	69-09-02	Abandoned after blow-out
Panarctic Drake Point L-67	L-67-76-30-108-30	Potential Dual Gas	Gas. Dev.	Jurassic Bjorne	Sandstone	69-09-28	70-02-28	DST 282 10 <sup>3</sup> m <sup>3</sup> /d (Jurassic)
Panarctic et al Drake F-16	F-16-76-30-108-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	72-05-10	72-06-16	AOF 7466 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Drake B-44	B-44-76-30-108-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	72-09-23	72-10-22	DST 155 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Drake D-68	D-68-76-30-108-30	Potential Gas	Gas Dev.	Jurassic Bjorne	Sandstone	73-06-07	74-03-25	DST 245 10 <sup>3</sup> m <sup>3</sup> /d DST 1.1 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Drake E-78	E-78-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	74-05-02	74-05-27	DST 135 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Drake D-73	D-73-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	75-04-23	75-05-10	DST 228 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Drake F-76	F-76-76-30-108-00	Suspended Gas	Gas Dev.	Jurassic	Sandstone	78-03-02	78-04-30	AOF 2169 10 <sup>3</sup> m <sup>3</sup> /d @88.0 kPa
Panarctic et al East Drake I-55	I-55-76-30-107-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	75-03-06	75-04-16	AOF 1634 10 <sup>3</sup> m <sup>3</sup> /d critical flow proved
Panarctic et al W. Hecla N-52	N-52-76-30-110-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	74-03-05	74-04-15	AOF 1465 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Hecla F-62	F-62-76-30-110-00	Potential Gas	Gas Discovery	Jurassic	Sandstone	72-11-11	72-12-12	AOF 2705 E. 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Hecla I-69	I-69-76-20-110-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	73-02-22	73-04-11	DST 220 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al E. Hecla C-32	C-32-76-30-110-00	Potential Gas	Gas Discovery	Jurassic	Sandstone	75-11-07	75-12-10	DST 239 10 <sup>3</sup> m <sup>3</sup> /d

Panarctic et al W. Hecla P-62	P-62-76- 30-110-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	76-01-07	76-02-22	DST 149 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al W. Hecla M-25	M-25-76- 30-111-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	76-03-14	76-04-18	DST 152 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Roche Pt. 0-43	0-43-75- 50-109-30	Abandoned Gas	Gas Discovery	Triassic	Sandstone	78-01-18	78-04-18	DST 5.6 10 <sup>3</sup> m <sup>3</sup> /d
<b>Thor Island</b>								
Panarctic et al Thor H-28	H-28-78- 10-103-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	73-02-28	73-05-10	Flow test to 1549 10 <sup>3</sup> m <sup>3</sup> /d
<b>Ellef Ringnes Island</b>								
Panarctic et al Kristoffer Bay B-06	B-06-78- 20-102-30	Potential Gas	Gas Discovery	Heiberg	Sandstone	71-11-09	72-03-17	DST 281 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Jackson Bay G-16A	G-16-78- 10-101-00	Potential Gas	Gas Discovery	Heiberg	Sandstone	76-03-16	76-04-30	DST 207 10 <sup>3</sup> m <sup>3</sup> /d
<b>King Christian Island</b>								
Panarctic King Christian D-18	D-18-77- 50-101-00	Abandoned	Gas Discovery	Heiberg	Sandstone	70-10-14	71-01-25	Abandoned after blowout
Panarctic King Christian D-18A	D-18-77- 50-101-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	70-11-26	71-03-15	AOF 7438 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al King Christian N-06	N-06-77- 50-101-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	71-05-13	71-09-20	AOF 9579 10 <sup>3</sup> m <sup>3</sup> /d
Dome Arctic Ventures Wallis K-62	K-62-78- 00-102-00	Potential Gas	Gas Discovery	Heiberg	Sandstone	72-11-27	73-02-21	DST 350 10 <sup>3</sup> m <sup>3</sup> /d
<b>Offshore Sverdrup</b>								
*Panarctic AIEG Whitefish H-63	H-63-77- 20-106-30	Potential Gas	Gas Discovery	Awingak Heiberg	Sandstone	79-02-18	79-05-21	
<b>Crude Oil Recoveries<sup>1</sup></b>								
<b>Ellesmere Island</b>								
Panarctic Romulus C-42	C-42-80- 00-84-00	Suspended	Oil & Gas Show	Jurassic Schei Point Bjorne	Sandstone	72-01-29	72-07-25	Area has potential
<b>Thor Island</b>								
Panarctic et al Thor P-38	P-38-78- 10-103-00	Suspended	Oil Show	Heiberg	Sandstone	72-04-06	72-05-10	Thin Oil leg on water

4. Arctic Coastal Plain – no successful wells to date.

5. Banks Basin – no hydrocarbon discoveries to date, but the area is considered to have a moderate potential for hydrocarbon accumulation.

6. Baffin Bay – Davis Strait – this “province” lies entirely offshore and to date has been explored by only two wildcat wells. It contains several areas that hold promise for future hydrocarbon discoveries: the Thule Basin off Greenland, Lancaster Delta, Home Bay Delta, Cumberland Delta, Lancaster Sound and Jones Sound.

7. Mackenzie – Beaufort Basin – oil and gas have been found in Paleozoic carbonates and in Lower Cretaceous and Tertiary sands. All these finds are in the Mackenzie Delta section, Adgo and Netserk being drilled from man-made islands in the shallow waters of the Beaufort Sea.

#### Crude Oil Discoveries

##### **Mackenzie Delta – Tuktoyaktuk Peninsula**

IOE Atkinson H-25	H-25-69- 50-131-45	Abandoned	Potential Oil Well	Lower Cretaceous	Sandstone	69-12-14	70-02-26	500.9 m <sup>3</sup> /d calc. 24.3° API
IOE Mayogiak J-17	J-17-69- 30-132-45	Abandoned	Potential Oil Well	Devonian & Lower Cretaceous	Carbonate & Sandstone	71-04-03	71-08-06	1163.8 m <sup>3</sup> /d 33.6° API



Imp. Ivik J-26	J-26-69-40-134-15	Suspended	Potential Oil & Gas Well	Tertiary	Sandstone	72-04-08	72-09-30	849.8 m <sup>3</sup> /d calc. 24° API
Imp. Ivik K-54	K-54-69-40-134-15	Abandoned	Potential Oil	Tertiary	Sandstone	73-03-30	73-06-08	131.9 m <sup>3</sup> /d calc. 24° API
Imp Adgo F-28	F-28-69-30-135-45	Plugged & Abandoned	Oil & Gas	Tertiary	Sandstone	73-12-28	74-03-19	238.5 m <sup>3</sup> /d 17.5° API
Imp Adgo	J-27-69-30-135-45	Abandoned Gas		Tertiary	Sandstone			
Shell Kugpik 0-13	0-13-69-20-135-15	Suspended	Oil	Lower Cretaceous	Sandstone	73-03-26	73-09-30	461.1 m <sup>3</sup> /d 50° API
Shell Kumak J-06	J-06-69-20-135-00	Suspended	Oil	Tertiary	Sandstone	73-11-24	74-05-01	795 m <sup>3</sup> /d 27.1° & 31.3° API
Shell Niglintgak M-19	M-19-69-20-135-15	Suspended	Oil & Gas	Tertiary	Sandstone	74-06-01	75-01-25	O.T.S. 18.8 32° API
Sun et al Garry P-04	P-04-69-30-135-30	Suspended	Oil & Gas	—	—	75-08-25	76-01-05	O.T.S. DST
Gulf Mobil Kamik D-48	D-48-69-00-133-15	Suspended	Oil & Gas	Lower Cretaceous	Sandstone	75-12-23	76-04-04	O.T.S. DST
<b>Beaufort Sea</b> Dome Hunt Nektoralik K-59	K-59-70-30-136-00	Abandoned	Oil & Gas			77-08-08	77-10-17	—
*Dome Hunt Kopanoar M-13 <sup>1</sup>	M-13-70-30-135-00	Abandoned	Oil	Tertiary	Sandstone	76-09-27	78-10-16	

<sup>1</sup>Dome Hunt Kopanoar M-13 was tested in 1979, and therefore is recorded as a 1979 discovery.

#### Gas Discoveries

##### **Mackenzie Delta – Tuktoyaktuk Peninsula**

Gulf Mobil Parsons F-09	F-09-69-00-133-30	Suspended	Gas & Condensate	Lower Cretaceous	Sandstone	71-01-20	72-04-19	DST 485 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons N-10	N-10-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	73-02-14	73-05-29	FT 958 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons L-37	L-37-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	76-12-26	77-04-02	DST 642 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons P-41	P-41-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	76-12-29	77-04-05	DST 190 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons A-44	A-44-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	75-04-09	75-07-22	DST 423 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons P-53	P-53-69-00-133-30	Suspended	Gas & Condensate	Lower Cretaceous	Sandstone	73-12-22	74-04-09	DST 234 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons 0-27	0-27-69-00-133-30	Suspended	Gas	Cretaceous	Sandstone	74-03-23	74-08-30	DST 77 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons L-43	L-43-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	75-12-10	76-03-04	DST 781 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons N-17	N-17-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	75-12-18	76-04-13	DST 634 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons D-20	D-20-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	76-04-21	76-11-22	DST 578 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Imp. Shell Reindeer F-36	F-36-69-10-134-30	Suspended	Gas	Tertiary	Sandstone	73-03-13	73-06-05	DST 138 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Siku C-11	C-11-69-10-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	75-12-26	76-03-22	DST 874 10 <sup>3</sup> m <sup>3</sup> /d Calc.

Gulf Mobil Siku A-12	A-12-69-10-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	76-04-14	76-07-26	DST 1 325 10 <sup>3</sup> m <sup>3</sup> /d (est)
Gulf Mobil Siku E-21	E-21-69-10-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	77-04-17	77-06-21	DST 815 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Imp. Shell Titalik K-26	K-26-69-10-135-00	Abandoned	Gas	Tertiary	Sandstone	72-10-17	73-02-20	DST 396 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Ya Ya A-28	A-28-69-20-134-30	Suspended	Gas	Tertiary	Sandstone	74-02-28	74-07-06	DST 319 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Ya Ya P-53	P-53-69-20-134-30	Suspended	Gas	Tertiary	Sandstone	72-12-08	73-03-20	DST 229 10 <sup>3</sup> m <sup>3</sup> /d
IOE Taglu G-33	G-33-69-30-134-45	Suspended	Gas	Tertiary	Sandstone	71-04-13	71-08-18	DST 809 10 <sup>3</sup> m <sup>3</sup> /d
IOE Taglu C-42	C-42-69-30-134-45	Suspended	Condensate	Eocene	Sandstone	72-04-30	72-11-18	DST 691 10 <sup>3</sup> m <sup>3</sup> /d Calc.
IOE Taglu W. P-03	P-03-69-30-135-00	Suspended	Gas	Eocene	Sandstone	71-12-12	72-03-29	178 10 <sup>3</sup> m <sup>3</sup> /d Max. flow rate
IOE Taglu D-43	D-43-69-30-134-45	Suspended	Gas	Eocene	Sandstone	73-03-23	73-09-11	AOF 854 10 <sup>3</sup> m <sup>3</sup> /d
IOE Mallik L-38	L-38-69-30-135-00	Abandoned	Potential	Tertiary	Sandstone	71-12-24	72-04-05	CCT.250 10 <sup>3</sup> m <sup>3</sup> /d calc.
Imp. Taglu H-54	H-54-69-30-134-45	Suspended	Gas	Tertiary	Sandstone	76-12-02	77-04-05	DST 71 10 <sup>3</sup> m <sup>3</sup> /d
Imp. Netserk F-40	F-40-69-40-135-45	Suspended	Gas	Tertiary	Sandstone	75-11-08	76-05-09	DST 251 10 <sup>3</sup> m <sup>3</sup> /d
Shell Kumak K-16	K-16-69-20-135-00	Suspended	Gas	Tertiary	Sandstone	75-02-23	75-07-13	DST 336 10 <sup>3</sup> m <sup>3</sup> /d
Shell Kumak E-58	E-58-69-30-135-00	Suspended	Gas	Tertiary	Sandstone	77-02-28	77-06-08	DST 482 10 <sup>3</sup> m <sup>3</sup> /d
Shell Niglintgak H-30	H-30-69-20-135-15	Suspended	Gas	Tertiary	Sandstone	72-10-24	73-04-07	DST 448 10 <sup>3</sup> m <sup>3</sup> /d
Shell Niglintgak B-19	B-19-69-20-135-15	Suspended	Gas	Tertiary	Sandstone	75-10-18	76-02-22	DST 243 10 <sup>3</sup> m <sup>3</sup> /d
Sun et al Garry P-04	P-04-69-30-135-30	Suspended	Oil & Gas	Tertiary	—	75-08-25	76-01-05	DST 491 10 <sup>3</sup> m <sup>3</sup> /d
Sun et al Garry G-07	G-07-69-30-135-30	Suspended	Gas Dev.	Tertiary	Sandstone	78-02-10	78-05-13	DST 57 m Cond.
Imp. Isserk E-27	E-27-70-00-134-15	Abandoned Gas	Gas Discovery	Tertiary	Sandstone	77-12-04	78-05-04	—
<b>Beaufort Sea</b> Dome Hunt Nektoralik K-59	K-59-70-30-136-00	Abandoned	Oil & Gas	Tertiary	Sandstone	77-08-08	77-10-17	—
Dome et al Ukalerk C-50	C-50-70-10-132-30	Abandoned	Gas	Tertiary	Sandstone	77-07-19	77-10-03	—
Dome Gulf et al Ukalerk 2C-50	C-50-70-10-132-30	Suspended	Gas	Tertiary	Sandstone	78-07-10	78-10-16	—

## 8. Interior Plains

**Great Slave Plain** – gas pools have been discovered in porous dolomites and limestones of Middle Devonian age.

Briggs Rabbit Lake No. 1	0-16-61-00-118-45	Potential Gas Well	Gas Discovery	Sulphur Point	Limestone	55-02-04	55-03-30	AOF 57 10 <sup>3</sup> m <sup>3</sup> /d (EST)
Briggs Rabbit Lake No. 2	B-07-61-00-118-45	Potential Gas Well	Gas Dev.	Sulphur Point	Limestone	57-02-09	57-03-14	AOF 170 10 <sup>3</sup> m <sup>3</sup> /d (EST)
Home Signal CSP Celibeta No. 2	H-78-60-10-122-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	59-12-26	60-03-24	AOF 226 10 <sup>3</sup> m <sup>3</sup> /d
H.B. Cameron Hills A-05	A-05-60-10-117-30	Potential Gas Well	Gas Discovery	Slave Point Sulphur Point	Limestone Dolomite	68-01-28	68-02-24	DST 232 10 <sup>3</sup> m <sup>3</sup> /d
H.B. Pan Am S. Island R. M-41	M-41-60-10-121-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	64-02-03	64-04-23	DST 161 10 <sup>3</sup> m <sup>3</sup> /d
H.B. Amoco S. Island R. M-52	M-52-60-10-121-00	Abandoned	Gas Dev.	Slave Point	Limestone	73-01-21	73-02-21	DST 37 10 <sup>3</sup> m <sup>3</sup> /d
Pacific Amoco Tathlina N-18	N-18-60-20-118-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	73-01-28	73-02-19	DST 51 10 <sup>3</sup> m <sup>3</sup> /d
Shell H.B. Grumbler G-63	G-63-60-20-115-45	Abandoned	Potential Gas Discovery	Slave Point	Limestone	69-02-14	69-03-16	DST 282 10 <sup>3</sup> m <sup>3</sup> /d
Sun Netla C-07	C-07-60-50-122-45	Potential Gas Well	Gas Discovery	Sulphur Point	Limestone	61-01-20	61-04-05	AOF 677 10 <sup>3</sup> m <sup>3</sup> /d
Texaco Bovie Lake J-72	J-72-60-10-122-45	Potential Gas Well	Gas Discovery	Nahanni	Dolomite	70-01-06	70-01-18	DST 74 10 <sup>3</sup> m <sup>3</sup> /d
Union Pan Am Trainor C-39	C-39-60-20-120-30	Potential Gas Well	Gas discovery	Sulphur Point	Carbonate	65-01-29	65-03-15	DST 226 10 <sup>3</sup> m <sup>3</sup> /d

**Great Bear Plain** – no discoveries to date.

**Mackenzie Plain** – oil is still produced at Norman Wells from the Devonian Kee Scarp formation and additional hydrocarbon shows have been encountered in the Cretaceous and Silurian age of formations of this “province”.

### Crude Oil Discoveries

#### Norman Wells Oil Field

Northwest Discovery No. 1	P-37-65-20-126-45	Abandoned	Oil Discovery	Devonian Canol	Fractured Shale	20-04-14	1923	2.0 m <sup>3</sup> /d
Northwest Discovery No. 2	P-37-65-20-126-45	Abandoned	Oil Discovery	Kee Scarp (Givetian)	Limestone	24-07	24-08	12.0 m <sup>3</sup> /d

85 additional wells were drilled to develop the field.

**Peel Plain** – no discoveries here as yet, but hydrocarbon shows have been encountered in Lower Devonian formations.

**Anderson Plain** – one gas discovery has been made at Tedji Lake, and several other hydrocarbon shows have been encountered.

Ashland et al Tedji Lake F-24	F-24-67-50-126-45	Suspended	Gas	Basal Cambrian	Sandstone	74-02-13	74-03-31	DST 127 10 <sup>3</sup> m <sup>3</sup> /d
-------------------------------	-------------------	-----------	-----	----------------	-----------	----------	----------	---

9. Liard Plateau and Range – gas is being produced in this province at the Beaver River (B.C. portion) and Pointed Mountain fields from dolomites of the Nahanni Formation of Middle Devonian age. The Beaver River field (Y.T. portion) produced gas from Mississippian sands. Gas has also been discovered at North Beaver River and La Biche.

#### Northwest Territories

C.P.O.G. et al La Biche F-08	F-08-60-40-124-30	Suspended	Gas Discovery	Middle Devonian	Argillaceous Limestone	71-02-25	71-03-19	DST 82 10 <sup>3</sup> m <sup>3</sup> /d
------------------------------	-------------------	-----------	---------------	-----------------	------------------------	----------	----------	--



Pan Am Pointed Mountain G-62	G-62-60-30-123-45	Gas Well	Gas Dev.	Middle Devonian Carbonate	Dolomite	68-07-09	69-06-23	Flow back 339 10 <sup>3</sup> m <sup>3</sup> /d
Pan Am Pointed Mountain K-45	K-45-60-30-123-45	Gas Well	Gas Dev.	Middle Devonian Carbonate	Dolomite	67-09-15	68-05-08	AOF 2 130 10 <sup>3</sup> m <sup>3</sup> /d
Pan Am Pointed Mountain O-46	O-46-60-30-123-45	Gas Well	Gas Dev.	Devonian Nahanni	Dolomite	69-03-29	71-10-02 Extended Standby	AOF 545 10 <sup>3</sup> m <sup>3</sup> /d
Pan Am Pointed Mountain P-53	P-53-60-30-123-45	Gas Well	Gas Discovery	Devonian Nahanni	Dolomite	66-02-06	67-02-22	AOF 1979 10 <sup>3</sup> m <sup>3</sup> /d
Amoco B-2 Pointed Mountain F-38	F-38-60-30-123-45	Gas Well	Gas Dev.	Devonian Nahanni	Dolomite	72-08-22	73-10-07	AOF 818 10 <sup>3</sup> m <sup>3</sup> /d
Amoco Pointed Mountain A-55	A-55-60-30-123-45	Gas Well	Gas Dev.	Devonian Nahanni	Dolomite	74-03-01	74-08-08	Production tested 127 10 <sup>3</sup> m <sup>3</sup> /d

<b>Yukon Territory</b>								
Canada Southern et al North Beaver YT I-27	I-27-60-10-124-00	Suspended	Extension Test Gas Well	Middle Devonian	Carbonate	63-03-24	64-09-29	AOF 43 10 <sup>3</sup> m <sup>3</sup> /d
Columbia Gas et al Kotaneelee H-38	H-38-60-10-124-00	Gas Well	Gas Dev.	Middle Devonian	Carbonate	77-04-06	77-10-29	Production tested 592 10 <sup>3</sup> m <sup>3</sup> /d
Columbia et al Kotaneelee E-37	E-37-60-10-124-00	Suspended Gas Well	Gas Dev.	Middle Devonian	Carbonate	78-01-21	78-12-05	
Pan Am Beaver River YT G-01	G-01-60-10-124-15	Abandoned Gas Well	Gas Producer	Mississippian & Nahanni	Sandstone and Carbonate	68-06-12	69-03-10	AOF 192 10 <sup>3</sup> m <sup>3</sup> /d AOF 1120 10 <sup>3</sup> m <sup>3</sup> /d

10. Eagle Plain – significant hydrocarbon shows have been encountered, but no commercially interesting discoveries have been reported.

Canoe River Chance YT J-19	J-19-66-10-137-30	Potential Gas & Oil	Oil & Gas Discovery	Carboniferous Hart River	Conglomeratic Sandstone	67-12-14	68-02-17	DST 184 10 <sup>3</sup> m <sup>3</sup> /d
Socony Mobil WM Chance YT G-08	G-08-66-10-137-30	Potential Oil Well	Oil & Gas Discovery	Cretaceous Carboniferous Hart River	Sandstone Conglomeratic Sandstone	64-12-04	65-02-15	DST 93 10 <sup>3</sup> m <sup>3</sup> /d 360 m oil
Socony Mobil WM Birch YT B-34	B-34-66-10-136-45	Potential Gas Well	Gas Discovery	Carboniferous Hart River	Conglomeratic Sandstone	64-08-04	65-08-06	DST 206 10 <sup>3</sup> m <sup>3</sup> /d
Socony Mobil WM Blackie YT No. 1 M-59	M-59-66-00-137-00	Potential Gas Well	Gas Discovery	Permian	Conglomeratic Sandstone	63-12-11	64-03-27	DST 79 10 <sup>3</sup> m <sup>3</sup> /d
Wm Chance YT No. 1 M-08	M-08-60-10-137-30	Potential Gas or Oil Well	Gas & Oil Discovery	Cretaceous	Sandstone	59-05-30	60-05-25	4.37 mm Choke 142 10 <sup>3</sup> m <sup>3</sup> /d 0.5 m <sup>3</sup> /d
				Carboniferous Hart River	Conglomeratic Sandstone			

11. Peel Plateau – shows of hydrocarbons have been observed.

12. Old Crow Basin – no hydrocarbon discoveries have been made.

13. Whitehorse Plain – no hydrocarbon discoveries have been made.

## **Report of the Reserves Committee of the Canadian Petroleum Association - 1979**

Improvements in the natural gas supply and the substantial slowdown in the decline of conventional crude oil reserves were reported in the 1979 report of the Canadian Petroleum Association Reserves Committee. Its compilation of the remaining reserves is shown in Table 2.

Remaining established reserves of marketable natural gas increased to 2 496 057 million m<sup>3</sup>, an increase of 7.5 per cent over 1978 reserves. The industry's 1979 field effort resulted in the largest addition to reserves ever recorded in a single year, amounting to 334 per cent of 1979 production.

Remaining established reserves of conventional crude oil decreased slightly to 1 082 million m<sup>3</sup>, a 0.7 per cent decline from 1978. The 1979 field effort resulted in the smallest percentage decline in reserves recorded since 1969 — 90 per cent of production was replaced. The major 1979 additions were due to enhanced recovery projects such as Norman Wells in the Northwest Territories, and Judy Creek in Alberta as well as to conventional heavy oil development in Saskatchewan and Alberta.

**Table 2 - Canadian Petroleum Association Estimate of Reserves**

*Liquid Hydrocarbons*

*Remaining Established Reserves North of 60° and Total for Canada*

Thousand Cubic Metres

1 Cubic Metre = 6.2898 Barrels

1 Cubic Metre = 35.3147 Cubic Feet

Region	Remaining Reserves 78-12-31	1979 Net Production	Remaining Reserves at 79-12-31	Net Change in Reserves during 1979
<i>Crude Oil</i>				
Mainland Territories (S. of 68° N)	10 598	158	21 148	10 550
Canada Total Crude Oil	1 090 058	79 469	1 082 004	-8 054
<i>Pentanes Plus</i>				
Mackenzie Delta - Beaufort Sea	8 381	-	8 302	-79
Canada Total Pentanes Plus	103 041	5 929	93 492	-9 549
<i>Propane, Butane &amp; Ethane</i>				
Canada Total Propane, Butane & Ethane	126 621	7 464	113 546	-13 075
Canada Total Liquid Hydrocarbons	1 319 720	92 862	1 289 042	-30 678

*Marketable Natural Gas*

*Remaining Established Reserves North of 60° and Total for Canada*

Million Cubic Metres at 101.325 kPa and 15°C

Region	Remaining Reserves 78-12-31	1979 Net Production	Remaining Reserves at 79-12-31	Net Change in Reserves during 1979
<i>Marketable Natural Gas</i>				
Mainland Territories (S. of 68° N)	16 863	517	16 211	-652
Mackenzie Delta - Beaufort Sea	185 880	—	184 123	-1 757
Arctic Islands	306 617	—	397 619	91 002
Canada Total - M.N.G.	2 322 213	63 759	2 496 057	173 844



### Summary of Oil and Natural Gas Resources

The Department of Energy, Mines and Resources has estimated the likelihood of existence of oil and gas resources in the various regions of Canada. These estimates are reproduced in Table 3\* and are based on data available at the end of 1975. New data on Western Canada is now available in a report released in January 1980.

**Table 3** - Summary of Oil and Natural Gas Resources - 1975

(Remaining Reserves, Discovered Resources and Undiscovered Potential)

Region	Likelihood of Existence "50/50"		
	"High" 90% Proba- bility	Chance" 50% Proba- bility	"Low" 10% Proba- bility
	Oil Resources (billions of barrels)		
Atlantic Shelf South	1.2	1.9	3.0
Labrador-East Newfound- land Shelf	1.7	2.6	4.5
Northern Stable Platform Basins	0.01	0.06	3.2
St. Lawrence Lowlands	0.04	0.09	0.2
** Western Canada	10.9	11.7	13.5
Mainland Territories	0.3	0.5	1.0
Mackenzie Delta-Beaufort Sea	4.3	6.9	12.0
Sverdrup Basin	1.1	2.0	4.0
Arctic Fold Belts	0.5	1.8	4.3
Total Canada (Accessible Regions)	25.0	30.0	43.0

Region	Gas Resources (trillions of cubic feet)		
	8.6	13.2	20.0
Atlantic Shelf South	8.6	13.2	20.0
Labrador-East Newfound- land Shelf	18.0	26.7	45.0
Northern Stable Platform Basins	0.4	2.3	12.0
St. Lawrence Lowlands	0.7	1.4	3.2
** Western Canada	89.0	97.0	107.0
Mainland Territories	6.0	9.7	20.0
Mackenzie Delta-Beaufort Sea	39.0	60.0	99.0
Sverdrup Basin	21.0	40.0	80.0
Arctic Fold Belts	2.9	11.0	26.0
Total Canada (Accessible Regions)	229	227	378

*Note:* These columns do not total arithmetically to the Canada totals because individual curves must be summed using a statistical technique described elsewhere in the Report.

\* Extracted from Oil and Natural Gas Resources of Canada, 1976, Report EP-77-1, Department of Energy, Mines and Resources.

\*\* New estimate available. See GSC Open File Report 672. January 1980.

Oil and gas land activities during 1979 continued under authority of the Canada Oil and Gas Land Regulations. Amendments made to these Regulations in 1977 provided authority for the first new disposal of oil and gas rights since 1969, and by December 1979, leases had been issued for all applications on hand. As a result of a public call for submission of exploration proposals in July 1979, a single exploration agreement was concluded with Dome Petroleum Limited with respect to a block of 770 000 hectares in the Arctic Islands.

The decline in the total holdings amounted to about 15 per cent of the area held during 1978, reflecting the maturing of permits. Existing permits covering more than 31 million hectares will be maturing in the last half of 1980. (See Table 4 and Figure 2.) Also as a result of expiring permits, the total area under lease increased (Figure 3). Continued interest in exploratory operations is reflected in several drilling commitments in the southern parts of the Yukon and the Northwest Territories, and a widespread concentration of effort in the more costly and remote regions such as the offshore areas of the Mackenzie Delta, the Beaufort Sea, the Arctic Islands, and Baffin Bay and Davis Strait. In the Delta areas, an increasing number of expiring permits were being extended beyond their statutory terms into special renewal terms under the regulations. These holdings presently exceed 8.1 million hectares and are granted under discretionary authority with annually escalating work requirements designed to ensure an orderly assessment of potential oil and gas reserves.

The 1977 amendments to the regulations provided certain options for holders of lease applications and expiring permits. By the end of 1978 the option period had expired, and during 1979 about 1 400 leases, applications for some of which had been received as early as 1972, had been issued. In order to provide interim support for evaluation of prospects on and adjacent to lands held under lease, 10 leases with drilling commitments were issued during 1979, about half of which will involve drilling operations in the extreme southern portions of the Yukon and Northwest Territories. The amended regulations also established a preferential right for Petro-Canada to select Crown reserve areas to be held under exploration agreements. To date Petro-Canada has selected about 10.9 million hectares offshore in the eastern Arctic which presently are the subject of negotiations for the terms and conditions of exploration agreements. In order to facilitate discussions respecting native claims in the eastern mainland region, the selection and negotiation process for Petro-Canada's preferential rights in the area was deferred until August 1979, with negotiations for exploration agreements to follow when the anticipated policy decisions have been made.

**Table 4** – Number of Issued Exploration Rights (Including Permits, Special Renewal Permits and Exploration Agreements) and Leases, with Relevant Extent as of December 31, 1979.

Area	Exploratory Rights		Leases	
	No.	Area (ha)	No.	Area (ha)
NWT Mainland	130	2 609 528	1 208	2 758 837
Yukon Mainland	100	1 451 519	183	278 981
Arctic Islands	2 542	50 654 465	152	376 959
Arctic Coast Marine	507	9 257 225	67	178 092
Total	3 259	63 972 737	1 610	3 592 869

Figure 2  
Area Held Under Oil and Gas Permit  
Yukon Territory and Northwest Territories

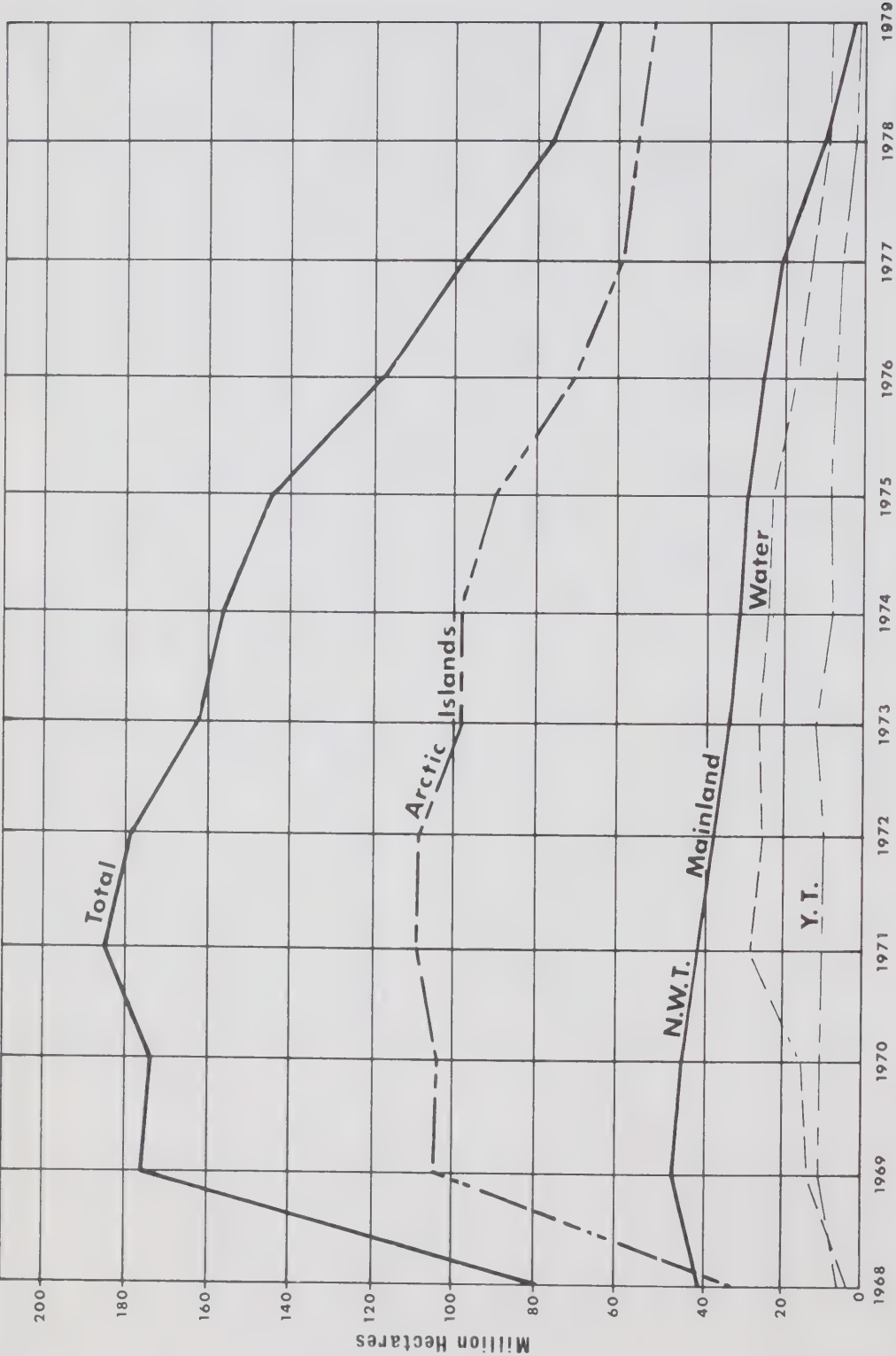
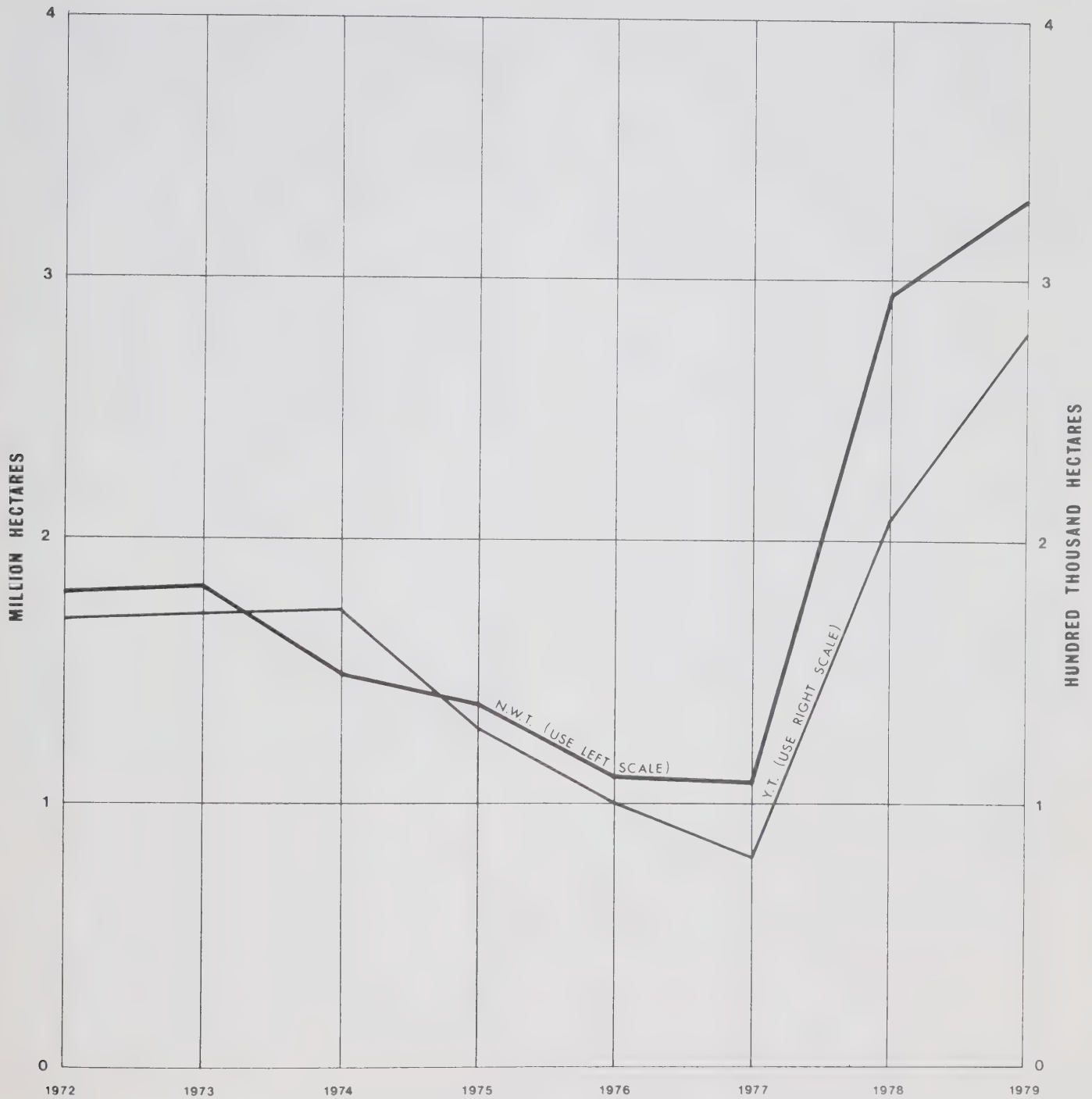




Figure 3  
**Acreage Under Lease by Year**  
 Yukon Territory and Northwest Territories



# Acts and Regulations

## Canada Oil and Gas Land Regulations

The terms for permits already issued under the existing Canada Oil and Gas Land Regulations are summarized in Figures 4 and 5. Figure 4 shows the permit term in years, including the renewals granted subsequent to the initial term and the total per acre\* minimum work requirements to be met during the permit life. The minimum deposit and work requirements for each period of the permit life and entry into special renewal terms are illustrated in Figure 5. Figure 6 shows diagrammatically the flow of Canada oil and gas rights, through the various disposal channels under the present regulations.

The Canada Oil and Gas Land Regulations were amended late in 1977, in order to establish some of the principles contained in the government's policy statement of May 1976. Some of the significant elements of the revised regulations included replacing the oil and gas permit with an exploration agreement as a vehicle for future disposals of oil and gas rights; issuing of new oil and gas leases or continuing of existing leases by special renewal permit at the option of lease applicants; negotiating continuation of expiring permits under special renewal permit; and establishing the preferential right of Petro-Canada to acquire Crown reserves and to participate in certain existing exploratory permits. Also included was a method of determining the actual beneficial ownership of certain oil and gas rights by Canadians.

The amendments made to the regulations in 1977 were intended as an interim measure in order to implement some of the elements proposed in legislation that was introduced in December of that year but did not receive parliamentary approval. That legislation was designed to provide a new management regime that would stimulate increased frontier exploration and give an early re-assessment of Canada's hydrocarbon reserves. It included fiscal and land holding incentives as well as provisions for increased government control over the timing, direction, rate and level of exploration, development and production activities. It also provided increased benefits for, and participation by Canadian firms – including Petro-Canada – engaged in development of Canada's resources. In addition, provision was made for the introduction of a progressive incremental royalty system in order to ensure a fair economic return to the Canadian people from resource development. The legislation also continued the accepted principle of minimizing front-end loading charges and the concept of unitary development, whereby the industry would be assured of rights to produce all hydrocarbon reserves within its development areas.

Other matters proposed or required to be dealt with in legislation include:

- modified work obligations for certain existing permits;
- modified confidential periods for reports of exploratory projects;
- ministerial authority:
  - to order the drilling of wells and commencement of production;
  - to determine product prices;
  - to require submission of contracts and agreements respecting transfers and interests in oil and gas rights as supply transfers; and
  - to establish levels of minimum Canadian participation in resources ownership.

It is anticipated that a new Canada Oil and Gas Act will be introduced into Parliament in 1980 and that this act will supercede the present oil and gas land management regime to bring it more in line with present policy and national energy-related objectives.

\*Since relevant acts and regulations have not yet been changed, the conversion to hectares could not be made.



The Bristol Aerospace automatic weather station in the ice of the Beaufort Sea.

### **Canada Oil and Gas Geophysical Regulations**

A joint project was initiated by the departments of Indian Affairs and Northern Development and Energy, Mines and Resources to draft the Canada Oil and Gas Geophysical Regulations for promulgation under the Canada Oil and Gas Production and Conservation Act. Sections of the regulations will pertain to on-shore and offshore geophysical operations on Canada Lands.

The primary intent of these regulations will be to ensure:

- the safety of personnel working on geophysical crews;
- the protection of the living resources of the on-shore and marine areas to be surveyed;
- the quality and type of geophysical data submitted to the relevant resource organizations.

In 1979, the Legal Division of Energy, Mines and Resources prepared the final draft for submission to the Department of Justice.

### **Canada Oil and Gas Pipeline Regulations**

These regulations have been drafted over the past several years by staff of the departments of Indian Affairs and Northern Development and Energy, Mines and Resources, under the Canada Oil and Gas Production and Conservation Act. Subsequent joint meetings with an industry task force were held in 1977 to discuss these regulations. The Canada Oil and Gas Pipeline Regulations have been submitted to the Legal Division of Energy, Mines and Resources for editing in preparation for promulgation.

### **Canada Oil and Gas Production Regulations**

The Canada Oil and Gas Production Regulations were redrafted in 1979 and will be submitted again to the industry task force in 1980 for review and comment.

### **Canada Oil and Gas Drilling Regulations**

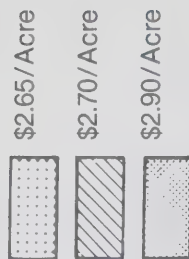
A joint project was initiated by the departments of Indian Affairs and Northern Development and Energy, Mines and Resources to draft the Canada Oil and Gas Drilling Regulations under the Canada Oil and Gas Production and Conservation Act. In 1978 the regulations pertaining to the drilling of both onshore and offshore wells were completed and reviewed with industry. The regulations were promulgated on January 18, 1979.



Canada Lands are administered by the Department of Indian Affairs and Northern Development north of the heavy line. Offshore areas elsewhere administered by the Department of Energy, Mines and Resources

**Figure 4**  
**Permit Terms and Work Requirement Zones**

North of 60°



Scale in miles

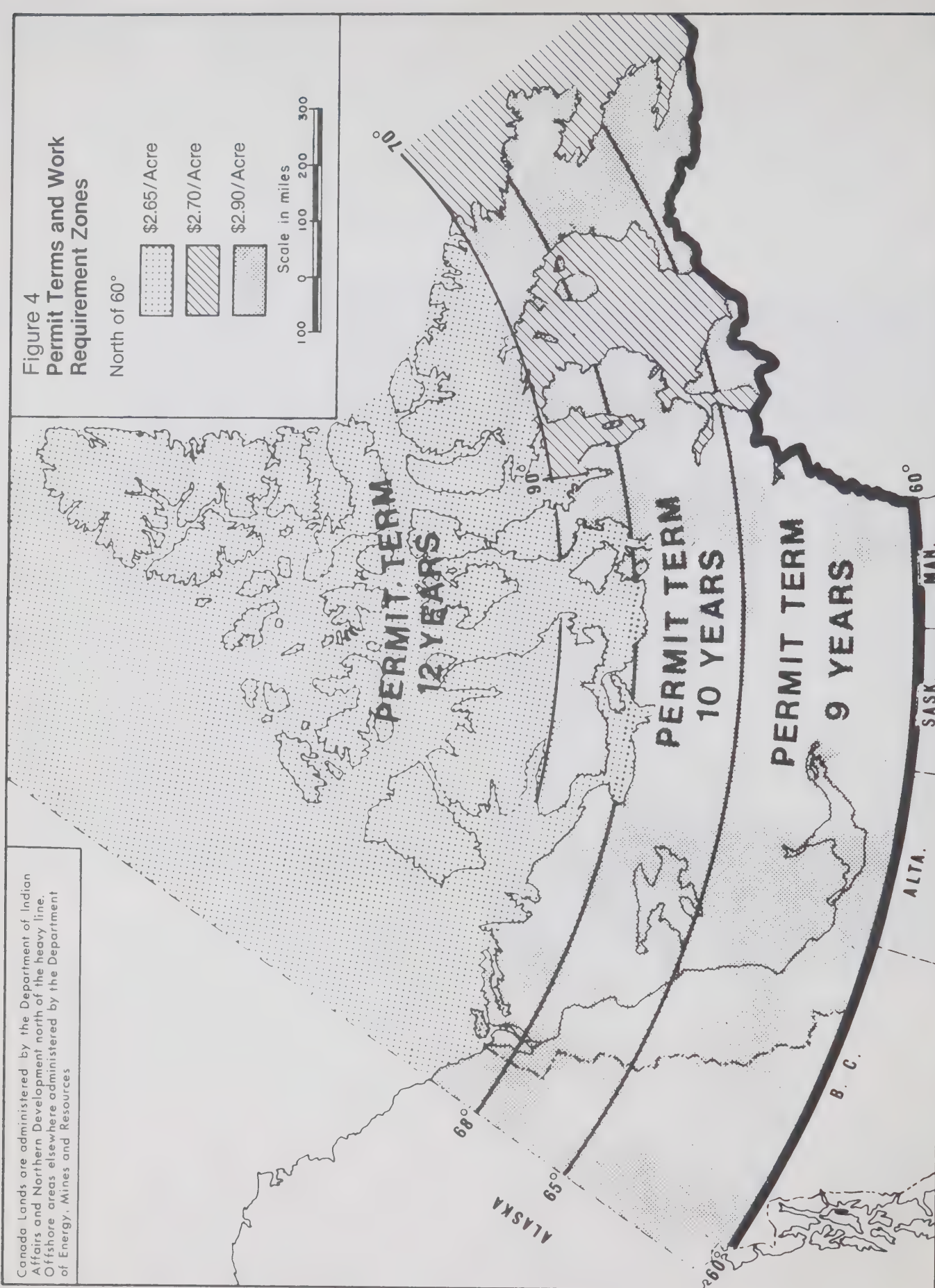


Figure 5  
 Permit Terms and Deposit Requirements  
 Per Acre  
 Yukon Territory and Northwest Territories

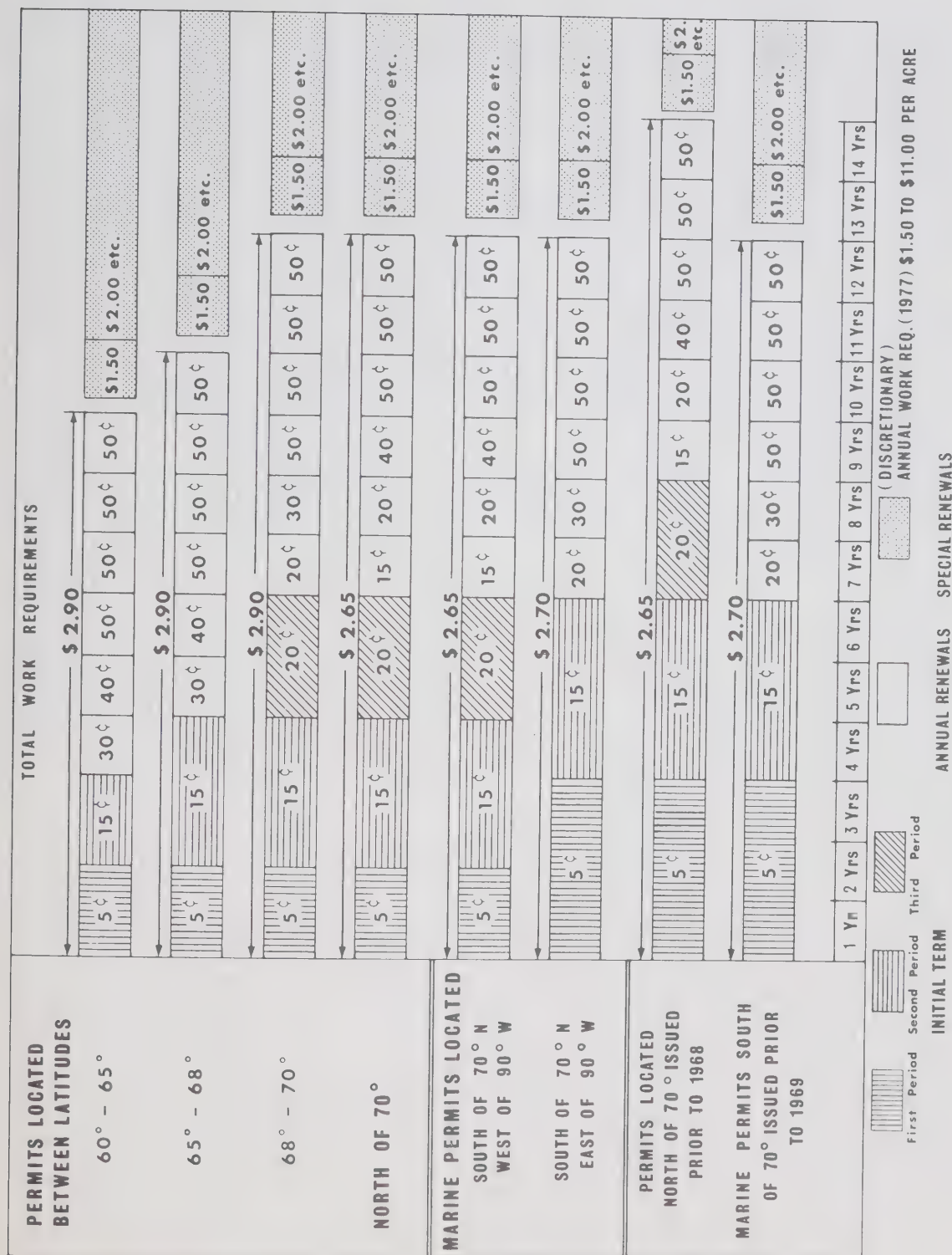
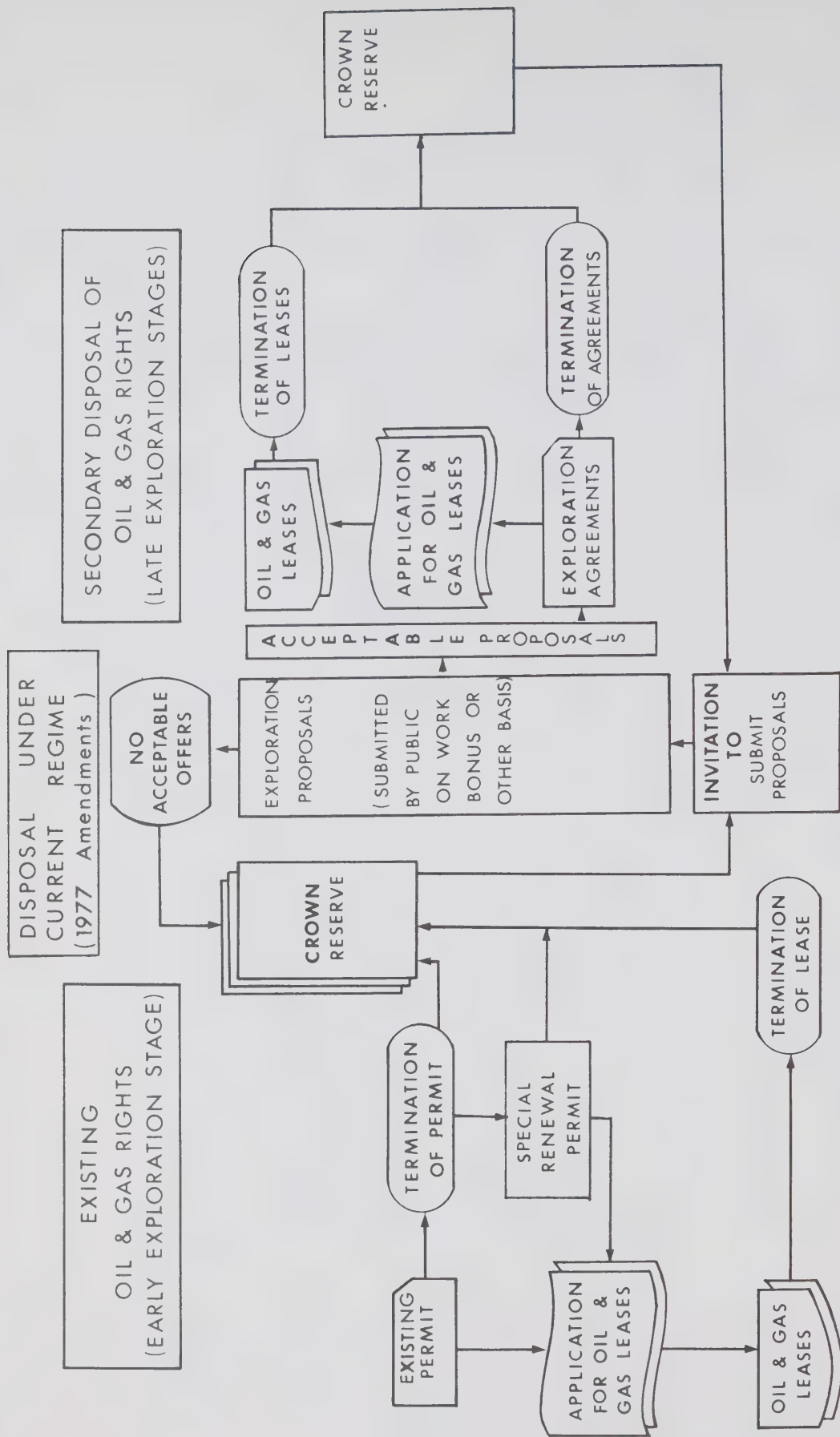


Figure 6





### **Land Use Regulations**

In June 1970, amendments to the Territorial Lands Act permitting the implementation of Territorial Land Use Regulations were passed by Parliament.

These regulations were promulgated on November 4, 1971. They provide authority for designating land management zones in the Yukon Territory and Northwest Territories. Within these zones most major land use operations, including resource exploration and development, require land use permits. These stipulate the measures to be followed by the operator to protect the environment. Permit conditions are established on the recommendation of the interdepartmental and intergovernmental Land Use Advisory Committee, following consultations with any northern community whose interests may be affected.

As a result of amendments to the Land Use Regulations, a new land-management zone was established effective November 1975, in order that the land use permit system should apply through the Northwest Territories.

Further revised Land Use Regulations were submitted for the minister's approval at the end of 1976. The amended regulations will apply to both large and small land use operations to ensure that every operation that could create a significant environmental impact is controlled by permit.

Equally important, sufficient time is provided to northern communities to comment fully on applications for permits that might affect their interests.

In the Northwest Territories, the Land Use Regulations are administered by the Regional Directorate, Northern Natural Resources and Environment Branch in Yellowknife, and in the Yukon Territory by the Regional Directorate, Northern Natural Resources and Environment Branch in Whitehorse.

### **Metrication in the Oil and Gas Industry**

The federal government introduced omnibus bills in each of the two previous years to facilitate Canadian conversion to SI (Système international) measurements. The oil and gas industry (in conjunction with the provincial and federal governments) put forward its plan for the metrication of all aspects of its work and this was approved by the Metric Commission on December 8, 1976. As of January 1, 1979, all transactions of the industry at all levels – operational, business and governmental – were required to be expressed in SI units.

Much of the operational work, drilling and construction for example, can already be easily converted, but difficulties and confusion could result in dealing with business and government departments. To make personnel throughout the whole industry thoroughly familiar with the metric system and competent in its use, the Canadian petroleum industry requested and financed a metrication training program. This program, begun in 1976 and continuing through 1979, is entitled *Metrication and SI Units for the Oil and Gas Industry: A Learning Program for Scientific and Professionals*. Books and audio tapes suitable for either individuals or groups are used as teaching aids.

# Revenues

Revenues from northern operations during the calendar year approximated \$11.1 million (Table 5 and Figure 7) up \$2.1 million from 1978 due mainly to the increase in rentals on issued leases.

Total revenues from all sources for the fiscal year 1979-1980 approximated \$10 million (Table 6 and Figure 8) about the same as the previous fiscal year.

Figure 9 shows the annual value of work bonus for oil and gas work bonus blocks, permits and exploration agreements. The cumulative value of work bonus to the end of 1979 was about \$59 million, an increase of \$100 000 from 1978, the result of issuing a single exploration agreement.



Figure 7  
 Gross Revenue - Oil and Gas from Fees,  
 Forfeitures, Royalties, Rentals and Sale of  
 Maps  
 Calendar Year  
 Yukon Territory and Northwest Territories

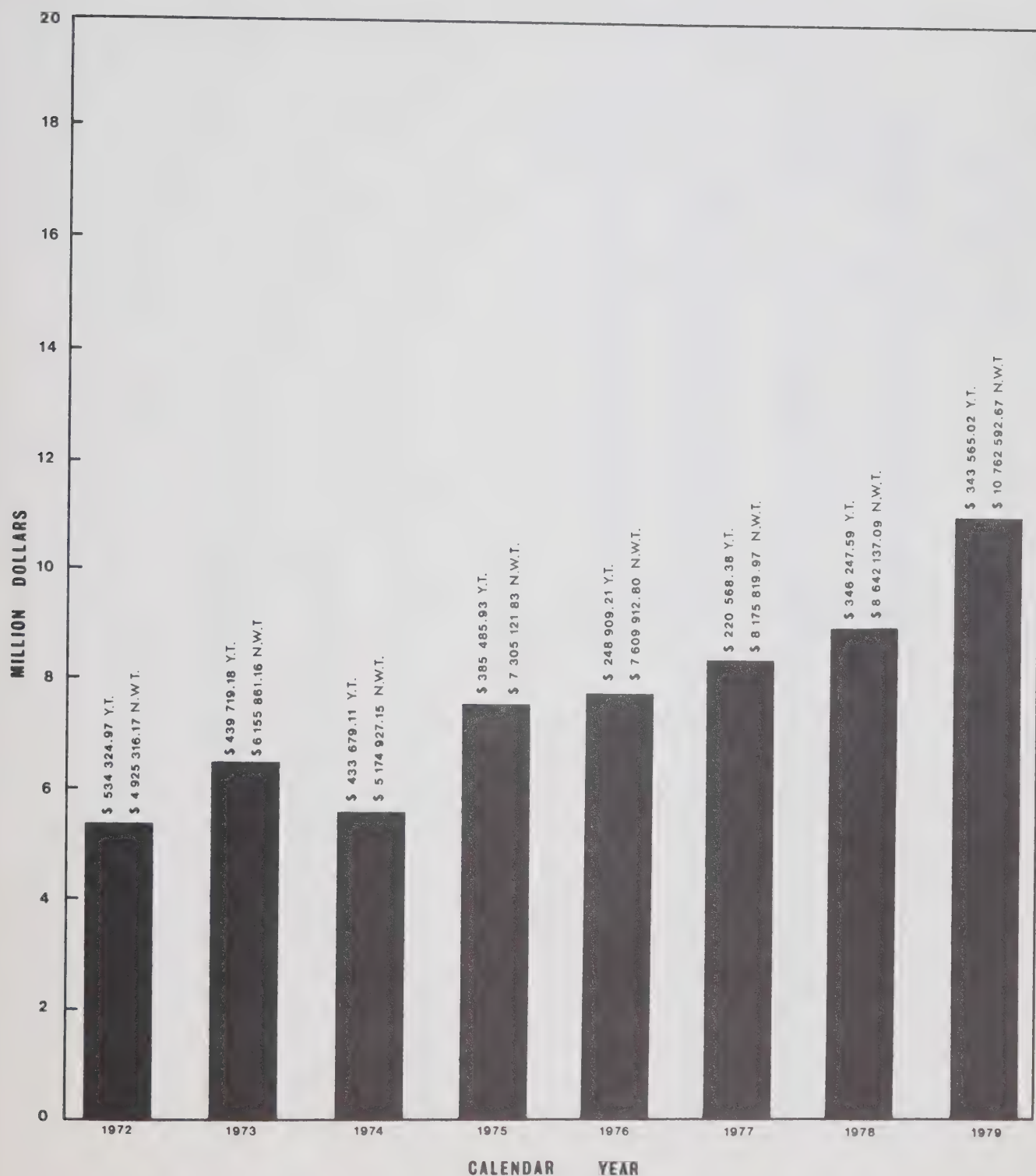




Table 5 – Gross Revenue, Oil and Gas (Calendar Year) 1973 to 1979

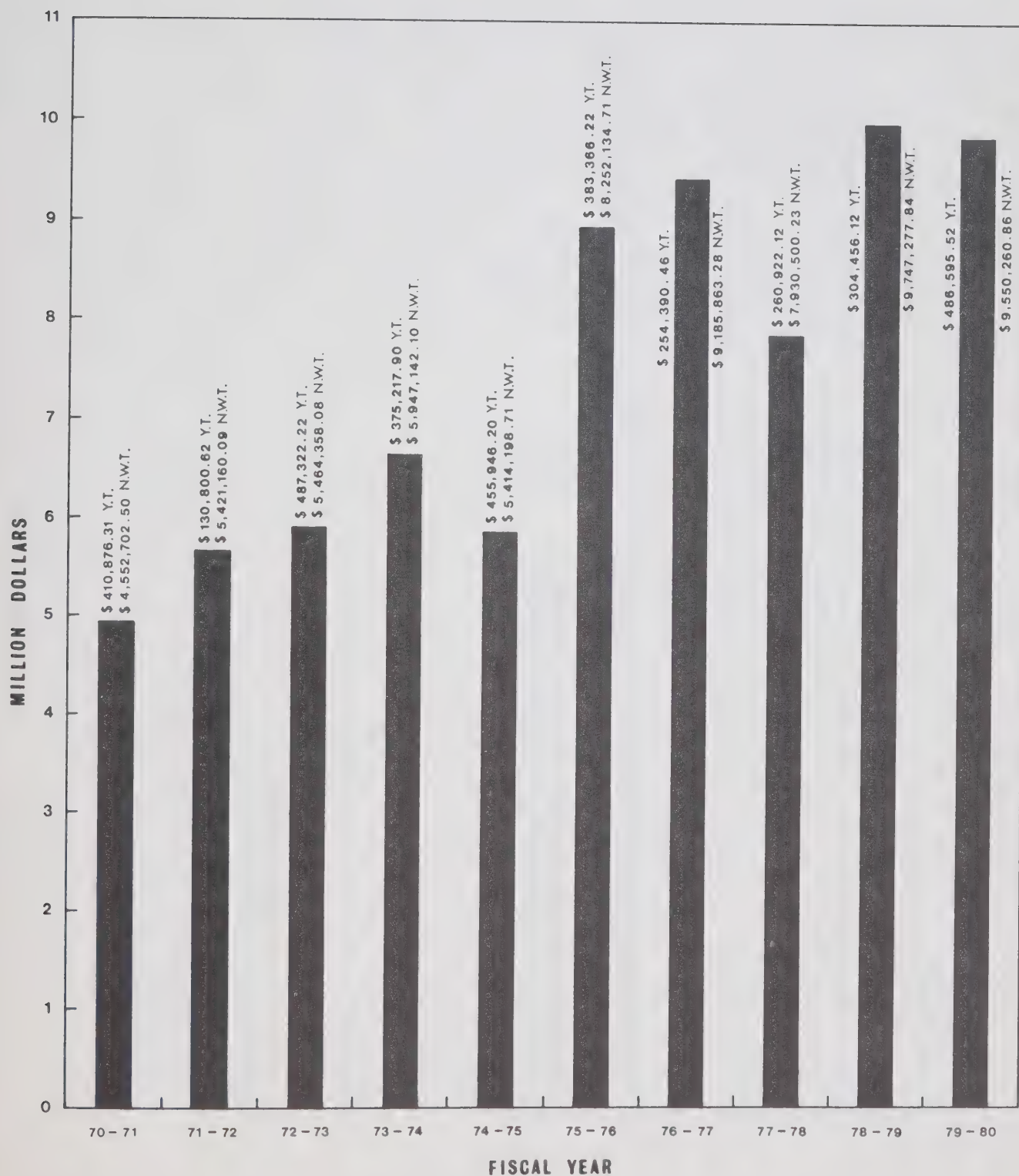
Year	Licence Fee	Permit Fee	Transfer Fee	Lease Fee	Rentals	Royalties	Forfeitures	Cash Bonus	Misc.	Total
<b>Northwest Territories</b>										
1973	\$ 4 100.00	\$183 500.00	\$ 30 235.00	\$ 1 950.00	\$ 4 836 714.92 <sup>1</sup>	\$ 734 962.91	\$ 359 957.30	-	\$ 4 441.03	\$ 6 155 861.16
1974	3 625.00	73 220.00	44 900.00	4 140.00	3 812 555.16 <sup>2</sup>	1 186 071.90	47 550.09	-	2 865.00	5 174 927.15
1975	2 750.00	4 000.00	10 005.00	3 970.00	3 684 559.54 <sup>3</sup>	3 425 965.83	172 517.93	-	1 353.53	7 305 121.83
1976	2 425.00	-	14 635.00	4 670.00	2 675 065.79	4 688 996.80	219 104.46	-	5 015.75	7 609 912.80
1977	2 600.00	-	12 635.00	6 320.00	3 266 775.28	4 778 130.10	105 853.49	-	3 506.10	8 175 819.97
1978	2 100.00	-	25 550.00	2 600.00	3 999 061.10	4 337 465.61	270 561.83	-	4 798.55	8 642 137.09
1979	475.00	1 500.00 <sup>4</sup>	18 105.00	1 718.50	5 564 311.51	5 136 151.06	40 300.60	-	31.00	10 762 592.67
Total	18 075.00	262 220.00	156 065.00	25 368.50	27 839 043.30	24 287 744.21	1 215 845.70	-	22 010.96	53 826 372.67
<b>Yukon Territory</b>										
1973	-	3 500.00	-	-	417 142.38	19 075.80	-	-	-	439 719.18
1974	-	-	75.00	180.00	409 060.00	24 364.11	-	-	-	433 679.11
1975	-	-	3 610.00	90.00	204 281.25	177 504.68	-	-	-	385 485.93
1976	-	-	45.00	50.00	104 353.00	144 461.20	-	-	-	248 909.20
1977	-	-	1 075.00	110.00	155 065.25	64 318.13	-	-	-	220 568.38
1978	-	-	290.00	320.00	337 081.90	6 710.07	1 845.62	-	-	346 247.59
1979	-	-	80.00	200.00	320 195.25	23 089.77	-	-	-	343 565.02
Total	-	3 500.00	5 175.00	950.00	1 947 179.03	459 523.76	1 845.62	-	-	2 418 173.41

Total Revenues

1973	\$ 6 595 579.34
1974	5 608 606.26
1975	7 690 607.76
1976	7 858 822.00
1977	8 396 388.35
1978	8 988 384.68
1979	11 106 157.69
Total	56 244 546.08

<sup>1</sup> Permit Rental – Special Renewals (\$ 1 444 172.50)  
<sup>2</sup> Permit Rental – Special Renewals (\$ 34 574.00)  
<sup>3</sup> Permit Rental – Special Renewals (\$ 4 617.50)  
<sup>4</sup> Exploration Agreement Fee

Figure 8  
 Gross Revenue - Oil and Gas from Cash  
 Bonus Bids, Fees, Forfeitures, Royalties,  
 Rentals and Sale of Maps  
 Fiscal Year  
 Yukon Territory and Northwest Territories



**Table 6 – Gross Revenue, Oil and Gas (Fiscal Year)**

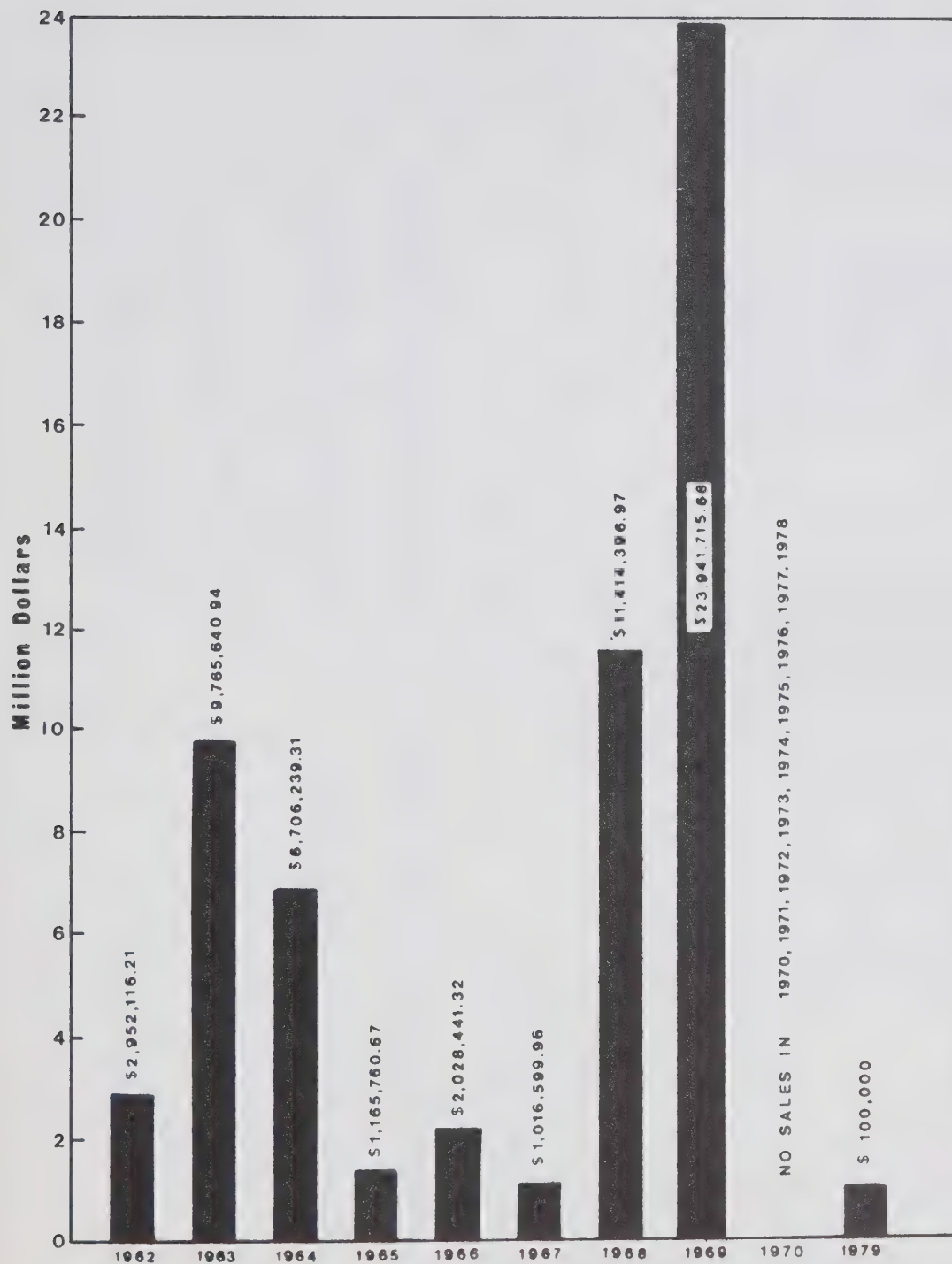
Fiscal Year	Licence Fee	Permit Fee	Transfer Fee	Lease Fee	Rentals	Royalties	Forfeitures	Cash Bonus	Misc.	Total
<b>Northwest Territories</b>										
1972-73	\$ 2 550.00	\$234 500.00	\$ 41 965.00	\$ 3 200.00	\$ 4 493 538.70	\$ 303 427.08	\$ 384 624.03	-	\$ 553.27	\$ 5 464 358.08
1973-74	4 100.00	189 500.00	19 440.00	2 170.00	4 808 931.18	729 372.07	188 606.71	-	5 022.14	5 947 142.10
1974-75	3 125.00	31 220.00	41 680.00	4 810.00	3 899 447.35	1 283 911.85	147 713.98	-	2 290.53	5 414 198.71
1975-76	1 320.00	-	8 955.00	4 040.00	3 718 493.34	4 352 171.61	165 716.01	-	1 438.75	8 252 134.71
1976-77	3 450.00	-	14 870.00	3 960.00	4 343 465.73	4 672 663.83	142 315.07	-	5 138.65	9 185 863.28
1977-78	825.00	-	15 670.00	6 490.00	3 488 769.99	4 624 080.66	105 853.49	-	2 811.20	8 244 499.74
1978-79	1 125.00	-	25 620.00	2 730.00	5 196 829.46	4 231 446.53	285 579.70	-	3 947.15	9 747 277.84
1979-80	400.00	1 500.00	16 130.00	1 228.50	4 998 883.82	4 491 795.94	40 300.60	-	22.00	9 550 260.86
Total	16 895.00	456 720.00	184 330.00	28 628.50	34 948 359.57	24 688 868.97	1 460 709.59	-	21 223.69	61 805 735.32
<b>Yukon Territory</b>										
1972-73	-	750.00	-	2 950.00	453 756.50	24 865.72	-	-	-	482 322.22
1973-74	-	3 500.00	-	-	357 644.38	14 073.52	-	-	-	375 217.90
1974-75	-	-	75.00	180.00	400 627.00	55 064.20	-	-	-	455 946.20
1975-76	-	-	3 635.00	90.00	184 243.25	195 397.97	-	-	-	383 366.22
1976-77	-	-	1 095.00	80.00	130 779.75	122 435.71	-	-	-	254 390.46
1977-78	-	-	-	140.00	230 641.15	29 216.00	1 845.62	-	-	261 842.77
1978-79	-	-	230.00	420.00	299 291.90	4 514.52	-	-	-	304 456.42
1979-80	-	-	115.00	40.00	392 012.28	94 428.24	-	-	-	486 595.52
Total	0	4 250.00	5 150.00	3 900.00	2 448 996.21	539 995.88	1 845.62	0	0	3 004 137.71
<b>Total Revenues</b>										
1972-73				\$ 5 946 680.30						
1973-74				6 322 360.00						
1974-75				5 870 144.91						
1975-76				8 635 500.93						
1976-77				9 440 253.74						
1977-78				8 506 342.51						
1978-79				10 051 734.26						
1979-80				10 036 856.38						
Total				64 809 873.03						



Figure 9  
**Value of Work Bonus Tenders - Oil and Gas**  
 Yukon Territory and Northwest Territories

Note: Cumulative Value End of December 1979

\$ 59 090 911.08



# Exploration, Discoveries and Drilling Operations

## Exploration

### ***Geological and Geophysical Surveys***

Aside from one crew-month of geological work in the Arctic Islands by Panarctic, there was very little geological surface work carried out north of 60° during 1979.

### ***Land Seismic Surveys***

Five crew-months of seismic surveys, all in the Arctic Islands and all by Panarctic, represent the total land seismic surveys for 1979, a decrease of 70 per cent from 1978. The surveys comprised two on-ice programs on behalf of the Arctic Islands Exploration Group and Panarctic, and covered a distance of approximately 780 km as compared with 3 260 km in 1978.

### ***Marine Seismic Surveys***

Marine seismic surveys were carried out by Dome, Esso, Canadian Superior, and Union Oil in the Beaufort Sea for a total of 8 056 km. In addition, Dome carried out site-specific surveys on drill sites to determine near-surface conditions with respect to the occurrence of hydrates, permafrost and shallow water sands. In the Davis Strait-Baffin Bay and Mackenzie River areas, Petro-Canada and Esso completed surveys totalling 7 110 km. These were reconnaissance programs to provide the operators with a fuller knowledge of the regional and structural geology of the areas.

In addition, Esso carried out a small survey (123 km) in the Mackenzie River in the Norman Wells field.

Table 7 shows the exploration survey statistics for all areas north of 60° and the comparison of the 1979 activities with those of previous years.

## Discoveries

During 1979 Dome made a major oil discovery in the Beaufort Sea and several significant gas recoveries were recorded. The initial indication of oil, made at Dome et al Kopanoar M-13 in 1978, was tested and proven in 1979; in addition gas recoveries were recorded at Ukalerk 2C-50, and oil and gas at Nerlerk M-98. Esso continued to evaluate the Adgo field by drilling the Adgo J-27 well; both oil and gas were recovered on tests. In the Arctic Islands, Panarctic Oils Ltd. drilled the Whitefish structure, making a major gas discovery in the Whitefish H-63 well.

Aquitaine indicated in a press release that a hydrocarbon-bearing zone was probable in the Hekja Ø-71 well in Davis Strait.

## Drilling

Drilling activity increased in 1979, due primarily to the further development of the Norman Wells Oil field. Twenty-nine wells, with a cumulative depth of 61 373 m, were drilled in the Yukon and Northwest Territories.

Figure 10  
**Exploration Activity**  
Yukon Territory and Northwest Territories

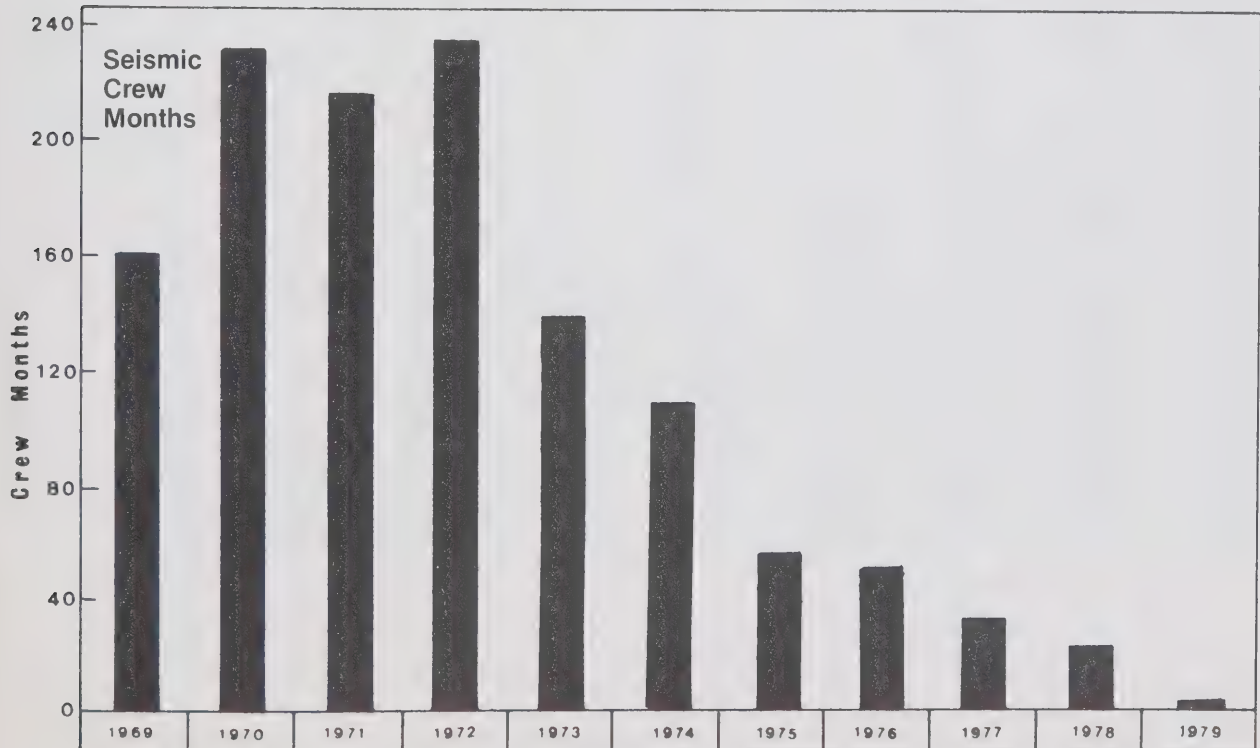
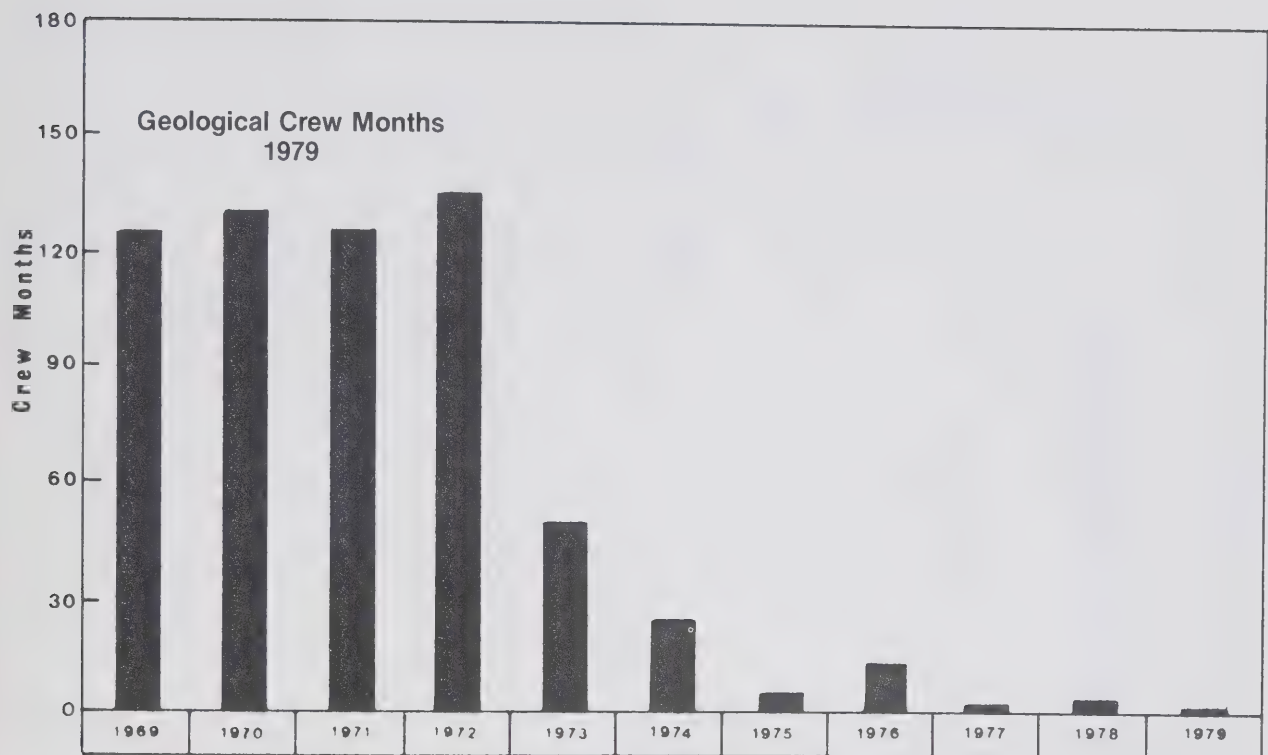
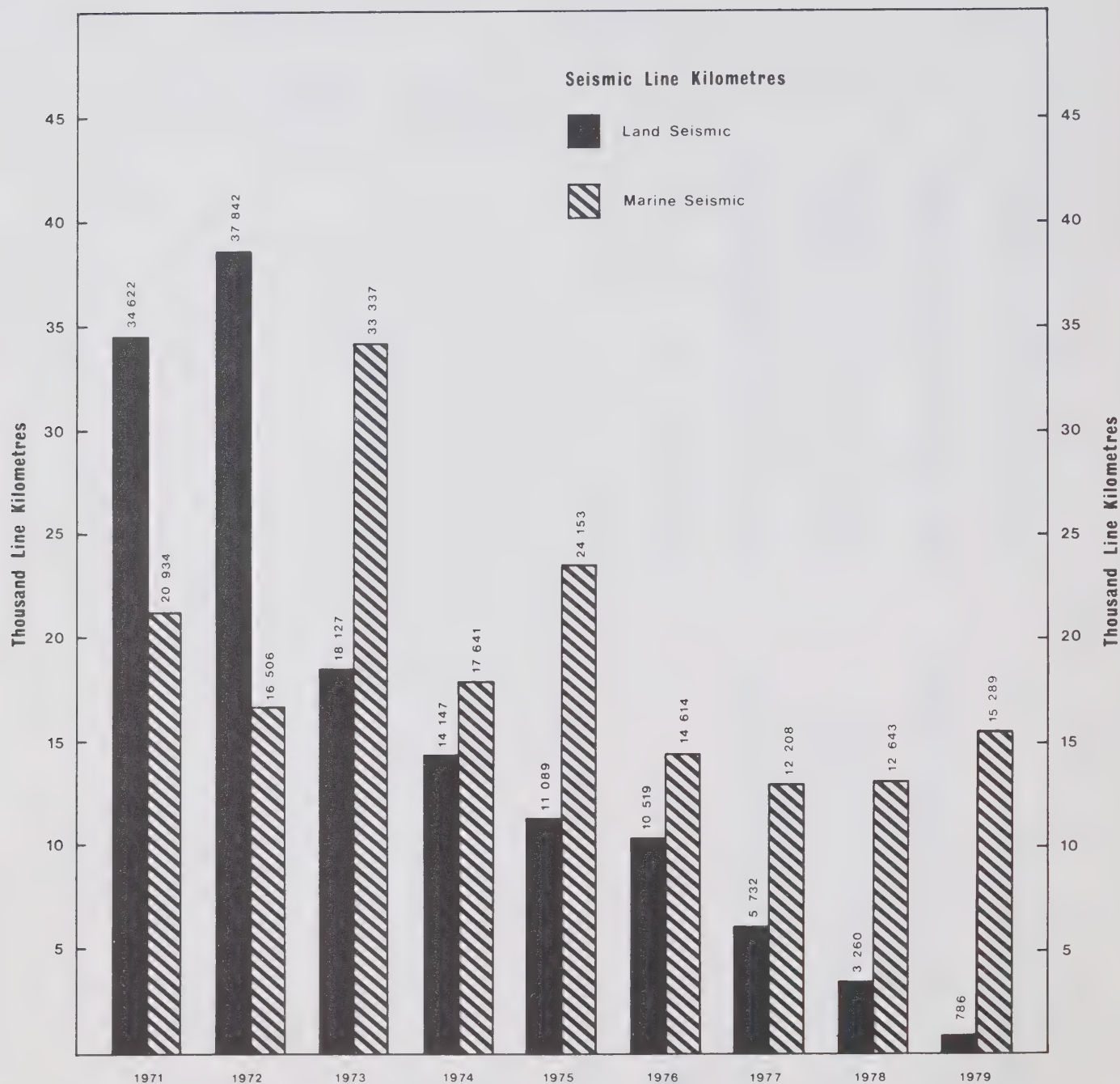




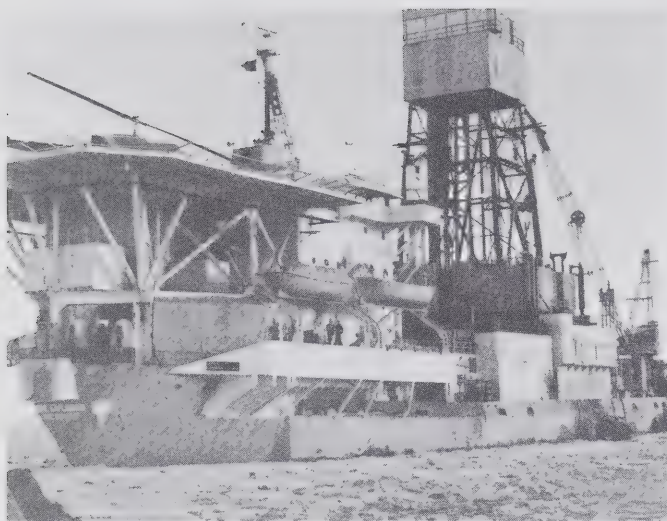
Figure 11  
**Exploration Activity**  
 Yukon Territory and Northwest Territories



**Table 7 - 1973-1979 Exploration Survey Statistics**

	Yukon Territory	N.W.T. Mainland	Mackenzie Delta	Beaufort Sea	Arctic Islands and Surrounding Water	Baffin Bay- Davis Strait	Total
<i>Geological</i>							
<i>Crew Months</i>							
1973	3.0	9.0	0	0	37.0	1.0	50.0
1974	3.5	1.5	4.5	0	15.5	0	25.0
1975	0	0	0	0	3.5	1.0	4.5
1976	4.0	1.5	1	0	5.5	1.0	13.1
1977	0	0	1.5	0	1.0	0	2.5
1978	0	0	3.0	0	1.0	0	4.0
1979	0	0	0	0	1.0	0	1.0*
<i>Land Seismic</i>							
<i>Crew Months</i>							
1973	10.0	25.0	42.0	4.0	58.0	0	139.0
1974	3.0	27.0	41.0	2.0	37.0	0	110.0
1975	0	14.5	10.5	0.1	32.0	0	57.1
1976	0	3.0	18.5	1.0	29.5	0	52.0
1977	0	0.5	10.0	0	21.5	0	32.0
1978	0	2.0	8.0	0	7.5	0	17.5
1979	0	0	0	0	5.0	0	5.0
<i>Seismic Line</i>							
<i>Kilometres</i>							
<i>Land</i>							
1973	984	1 855	5 593	757	8 939	0	18 127
1974	195	3 111	5 200	121	5 520	0	14 147
1975	0	2 531	1 093	14	7 449	0	11 089
1976	0	5 435	3 353	124	6 499	0	10 519
1977	0	77	811.9	0	4 843.3	0	5 732.5
1978	0	143	671	0	2 446	0	3 260
1979	0	5.4	0	0	780.2	0	785.6
<i>Marine</i>							
1973	0	29	0	7 412	8 061	17 834	33 337
1974	0	0	0	2 776	6 697	8 167	17 641
1975	0	0	0	4 135	5 380	14 638	24 153
1976	0	0	69	4 515	2 151	7 879	14 614
1977	0	0	0	4 668.7	3 410.2	4 129.6	12 208.5
1978	0	0	0	5 747	0	6 896	12 643
1979	0	123	0	8 056	0	7 110	15 289

\*A number of very small programs, too limited to record, were carried out in various areas in 1979.



Drillship *Canmar Explorer IV* on site in the Beaufort Sea.

## Offshore

### Western Arctic

Dome/Canmar added a fourth drillship to their fleet for the 1979 season in the Beaufort Sea, which increased the activity over that of previous years. Kopanoar M-13 and Ukalerk 2C-50 were fully tested resulting in the discovery of oil (954 m<sup>3</sup>/d) and oil and gas, respectively. Both Nerlerk M-98 and Tarsiut A-25 were drilled to total depth and tested; more extensive testing will be continued next season. Progress was made at Natsek E-56, and shallow drilling continued at Koakoak O-22, Kenalooak N-94 and Kaglulik M-64. The Kopanoar M-13 structure will be delineated by another well, Kopanoar 2L-34. The introduction of Dome's Ice Class 3 icebreaker, the *Canmar Kigoriak*, last summer, gives promise of an even longer drilling season next year. In addition, dredging at McKinley Bay has given Dome/Canmar a much more accessible winter harbour, which will permit the drilling season to be extended further.

### Eastern Arctic

The first drilling in Baffin Bay-Davis Strait waters occurred in 1979. Using the semi-submersible drilling platform SEDCO 709, Esso completed drilling the Gjoa G-37 well in 999 m water, in Davis Strait off the coast of Baffin Island, to a total depth of 3 998 m. Aquitaine, utilizing the *Ben Ocean Lancer* (a drillship), drilled their Hekja Ø-71 well in 350 m water, also in the Davis Strait. The Hekja Ø-71 well was suspended at 3 268 m for re-entry, drilling and testing in 1980.

### Arctic Islands

Panarctic Oils Ltd. continued exploration in the Arctic Islands, using ice platforms to drill Whitefish H-63, Desbarats B-73 and Hazen F-64 during the winter season, in addition to other land locations explored throughout the year. A total of nine wells were drilled by Panarctic, Phillips, and Dome Petroleum.

### Mainland

Esso Resources Ltd. engaged in delineation of their oil field at Norman Wells, drilling a total of 10 wells for development and water injection purposes, including three wells drilled from ice platforms in the Mackenzie River.

In addition, one well was drilled in the southern mainland by Paramount Oils.

### Mackenzie Delta

Activity decreased to the two Esso wells, at Adgo J-27 and Napartok M-01.

### Yukon

Columbia Gas was involved in the development of their Kotaneelee gas field, drilling a well for the purpose of water disposal.

Aquitaine drilled one well in the Peel Plateau – Eagle Plain, at Alder.



**Table 8 – Wells Abandoned or Completed in 1979.**

A total of 29 wells were drilled to total depth in 1979. The total depth drilled was 61 373 m. (D & A indicates dry and abandoned; WDW indicates water disposal well)

<i>Name of Well</i>	<i>Spudded</i>	<i>Completed</i>	<i>Status</i>	<i>Total Depth (metres)</i>
<b>Northwest Territories – Arctic Islands and Davis Strait</b>				
Chevron et al Parker River J-72 J-72-73-40-115-30	79-01-13	79-06-01	D & A	3 010
Dome Panarctic N. Dundas N-82 N-82-74-50-113-00	79-06-11	79-09-11	D & A	4 100
Dome Panarctic et al Hearne F-85 F-85-74-50-110-30	78-10-25	79-01-09	D & A	1 676
Dome Pan et al Hoodoo A-05 A-05-78-10-99-30	78-11-08	79-01-03	D & A	2 476
Esso HB Gjoa G-37 G-37-63-00-59-00	79-07-11	79-09-27	D & A	3 998
Mobil et al Cornwall O-30 O-30-77-30-94-30	79-06-05	79-10-15	D & A	3 584
Panarctic AIEG Desbarats B-73 B-73-76-50-105-30	79-02-12	79-03-27	D & A	1 085
Panarctic et al Noice D-41 D-41-78-30-104-00	78-11-04	79-01-02	D & A	2 347
Panarctic AIEG Whitefish H-63 H-63-77-20-106-30	79-02-19	79-05-21	Abandoned gas well	2 126
Phillips Aquit et al Hazen F-54 F-54-77-10-110-00	79-02-11	79-05-12	D & A	3 062

<i>Name of Well</i>	<i>Spudded</i>	<i>Completed</i>	<i>Status</i>	<i>Total Depth (metres)</i>
<b>Northwest Territories – Beaufort Sea</b>				
Dome Gulf et al Kopanoar L-34 L-34-70-30-135-00	79-10-11	79-11-09	Junked and abandoned	2 015
Dome Gulf et al Natsek E-56 E-56-69-50-139-30	78-07-10	79-10-06	Susp.	3 520
Dome et al Tarsiut A-25 A-25-70-00-136-15	78-10-18	79-10-23	Susp.	4 434
Dome et al Nerlerk M-98-70-30-133-00	77-10-07	79-10-28	D & A	4 940
Esso Adgo J-27 J-27-69-30-135-45	79-04-15	79-08-07	Abandoned oil & gas disc.	3 110
<b>Northwest Territories – Mainland</b>				
Esso Bear Island (21) E-46 E-46-65-20-126-45	79-10-07	79-10-25	Injection well	731
Esso Bear Island (22) K-36 K-36-65-20-126-45	79-11-01	79-11-19	Oil well	681
Esso Mackenzie River (1) C-47 C-47-65-20-126-45	79-01-17	79-02-07	Oil well abandoned	622

<i>Name of Well</i>	<i>Spudded</i>	<i>Completed</i>	<i>Status</i>	<i>Total Depth (metres)</i>
Esso Mackenzie River (2) H-57 H-57-65-20-126-45	79-02-16	79-03-02	Oil well abandoned	625
Esso Mackenzie River (3) A-47 A-47-65-20-126-45	79-03-08	79-03-31	Oil well abandoned	625
Esso Norman Wells (38X) B-48 B-48-65-20-126-45	79-04-15	79-05-14	Injection well	860
Esso Norman Wells (42X) L-27 L-27-65-20-126-45	79-05-19	79-06-09	Injection well	929
Esso Norman Wells (40X) P-37 P-37-65-20-126-45	79-06-09	79-06-28	Injection well	795
Esso Norman Wells (39X) N-37 N-37-65-20-126-45	79-07-04	79-08-19	Injection well	843
Esso Norman Wells (43X) D-38 D-38-65-20-126-45	79-07-09	79-08-28	Injection well	1 653
Esso PEX Napartok M-01 M-01-68-40-134-30	79-02-11	79-03-16	D & A	1 960
Paramount HB et al Cameron Hills M-31 M-31-60-10-117-00	79-03-08	79-04-02	Susp.	1 060
<b>Yukon Territory</b>				
Aquit Alder Y.T. C-33 C-33-66-00-136-45	78-03-08	79-03-05	D & A	3 174
Columbia et al Kotaneelee Y.T. M-17 M-17-60-10-124-00	79-01-01	79-03-05	W.D.W.	1 332

### 1980 Forecast

Exploration in the Arctic Islands in 1980 is expected to continue at about the same pace as in 1979. Four wells will probably be drilled, at least three of them from artificial ice islands. Seismic surveys will be generally restricted to inter-island on-ice programs.

In the Beaufort Sea, Dome, using four drillships, hopes to spud and complete at least five wells. In addition, two wells will be tested and abandoned. On the mainland and near-shore areas of the Mackenzie Delta, Esso will continue to drill at least one well a year.

The Norman Wells field will be further evaluated by the drilling of several injection and production wells. Esso will also submit a Norman Wells development plan to the department to initiate a total secondary scheme for the field. This may include the building of artificial islands in the river so that the field can be completely swept in the secondary recovery program.

In the southern Yukon and Northwest Territories, several operators will continue to drill shallow and medium depth wells to search for hydrocarbons in Devonian carbonates.

In Davis Strait, the Aquit Hekja Ø-71 well will be deepened and tested.

In all, 1980 operations north of 60° will be similar in scope to those of 1979, the main areas of activity being the Arctic Islands, Beaufort Sea and Norman Wells.

Figure 12

# Wells Completed or Abandoned in 1979

Southern Northwest Territories and Yukon Territory

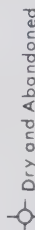
## LEGEND



Gas Well



Oil Well



Dry and Abandoned Well

Number of Wells Drilled In 1979-79

3300 m Total Depth

Drilled In 1979-79

100 miles

50

80.5

161 kilometres

No.	Depth	No.	Depth
1 Esso Bear Island (21) E-46	731 m	7 Esso Norman Wells (42 X) L-27	929 m
2 Esso Bear Island (22) K-36	681	8 Esso Norman Wells (40 X) P-37	795
3 Esso Mackenzie R. (1) C-47	622	9 Esso Norman Wells (39 X) N-37	843
4 Esso Mackenzie R. (2) H-57	625	10 Esso Norman Wells (43 X) D-38	1653
5 Esso Mackenzie R. (3) A-47	625	11 Paramount HB et al Cameron Hills M-31	1060
6 Esso Norman Wells (38 X) B-48	860	12 Columbia et al Kotanelee YT M-17	1332

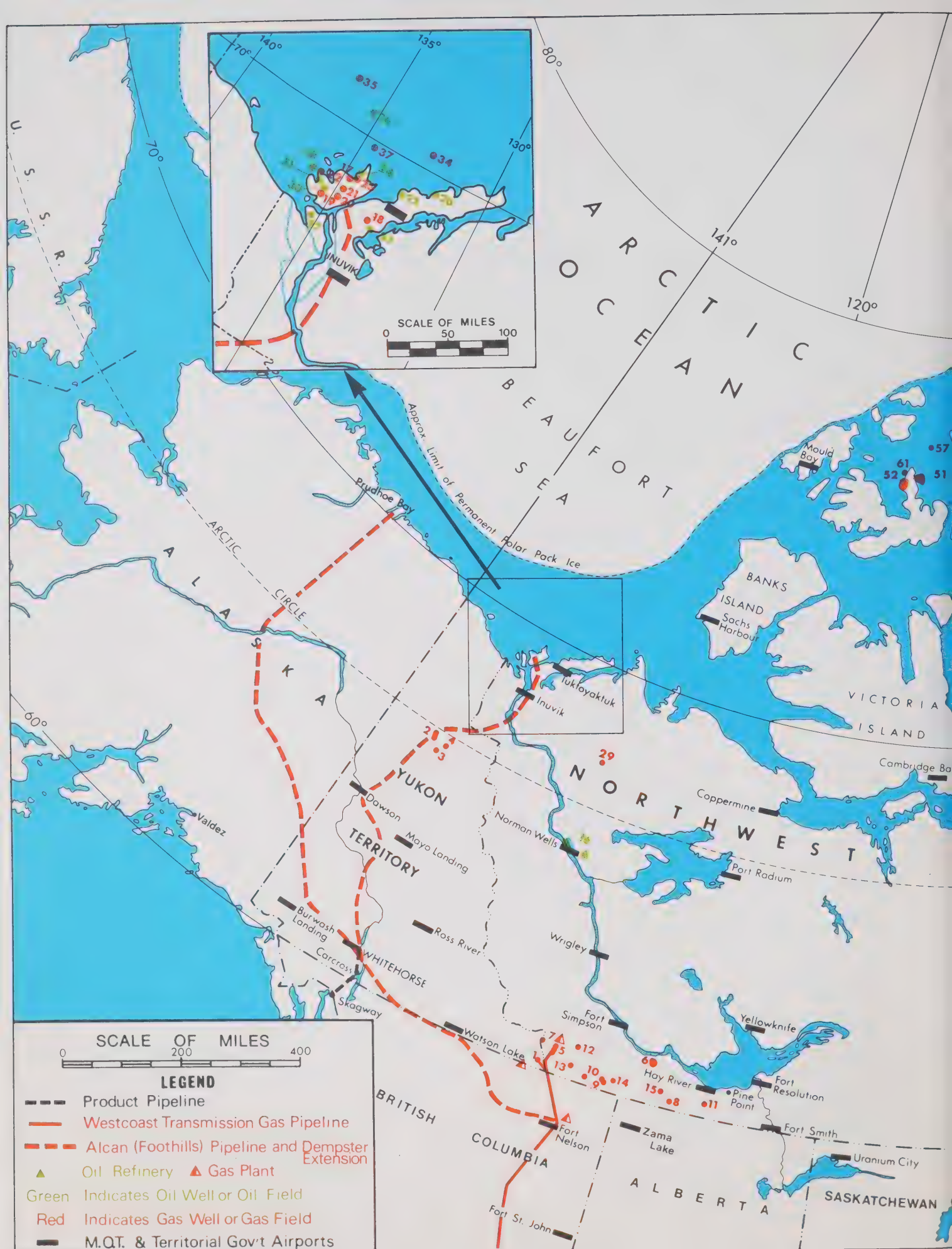
## Esso Development Wells

- 1-○
- 2-●
- 3-●
- 4-●
- 5-●
- 6-○
- 7-○
- 8-○
- 9-○
- 10-○

Norman Wells







# Oil and Gas Fields and Discoveries

## YUKON TERRITORY

- 1 Kotaneelee Gas Field
- 2 Chance Gas Field
- 3 Socony Mobil et al Blackie No. 1
- 4 Socony Mobil et al Birch Y.T. B-34

## NORTHWEST TERRITORIES

- 5 Pointed Mountain Gas Field
- 6 Rabbit Lake Gas Field
- 7 C.P.O.G. et al LaBiche F-08
- 8 H.B. Cameron Hill A-05
- 9 S. Island River Gas Field
- 10 Home Signal Celibeta H-78
- 11 Shell H.B. Grumbler G-63
- 12 Sun Netla C-07
- 13 Texaco Bovie Lake J-72
- 14 Union Pan Am. Trainer Lake C-39
- 15 Pacific Amoco Tathlina N-18
- 16 Normal Wells Oil Field
- 17 Taglu Gas Field
- 18 Parsons Gas Field
- 19 Gulf Imperial Shell Titalik K-26
- 20 Gulf Imperial Shell Reindeer F-36
- 21 Gulf Mobil Ya Ya P-53      A-28 Gas Pools
- 22 Shell Niglintgak H-30      M-19
- 23 Imperial I.O.E. Mallik L-38
- 24 Imperial Ivik J-26
- 25 I.O.E. Mayogiak J-17
- 26 I.O.E. Atkinson H-25
- 27 Shell Kugpik O-13
- 28 Imp. Adgo F-28
- 29 Ashland Tedji Lake F-24
- 30 Kumak Oil and Gas Field
- 31 Garry Oil and Gas Field
- 32 Imp. Netserk F-40
- 33 Gulf Mobil Kamik D-48
- 34 Dome Hunt Nektoralik K-59
- 35 Dome Gulf et al Ukalerk C-50
- 36 Hunt Dome Kopanoar M-13
- 37 Imp. Isserk E-27

## ARCTIC ISLANDS

- 51 Drake Point Gas Field
- 52 Hecla Gas Field
- 53 King Christian Gas Field
- 54 Panarctic Tenneco et al Kristoffer Bay B-06
- 55 Dome Arctic Ventures Wallis K-62
- 56 Thor Gas Field
- 57 Panarctic Whitefish
- 58 Dome Sutherland O-23
- 59 Panarctic Bent Horn N-72, A-02
- 60 Panarctic Jackson Bay G-16A
- 61 Panarctic Roche Point





**Figure 13**  
**Wells Completed or Abandoned in 1979**  
**Mackenzie Delta - Beaufort Sea**

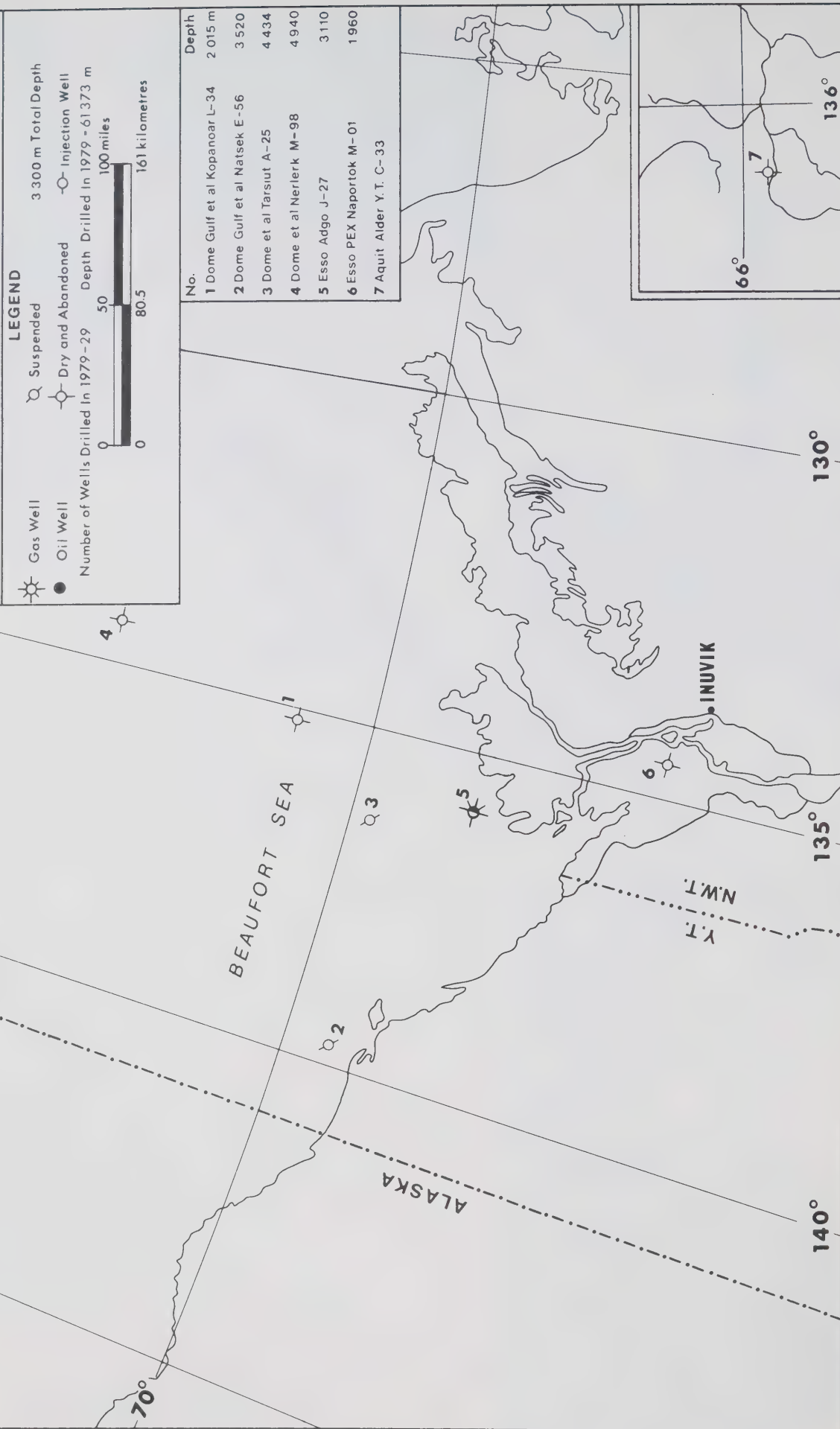




Figure 14  
Wells Completed or Abandoned in 1979  
Arctic Islands

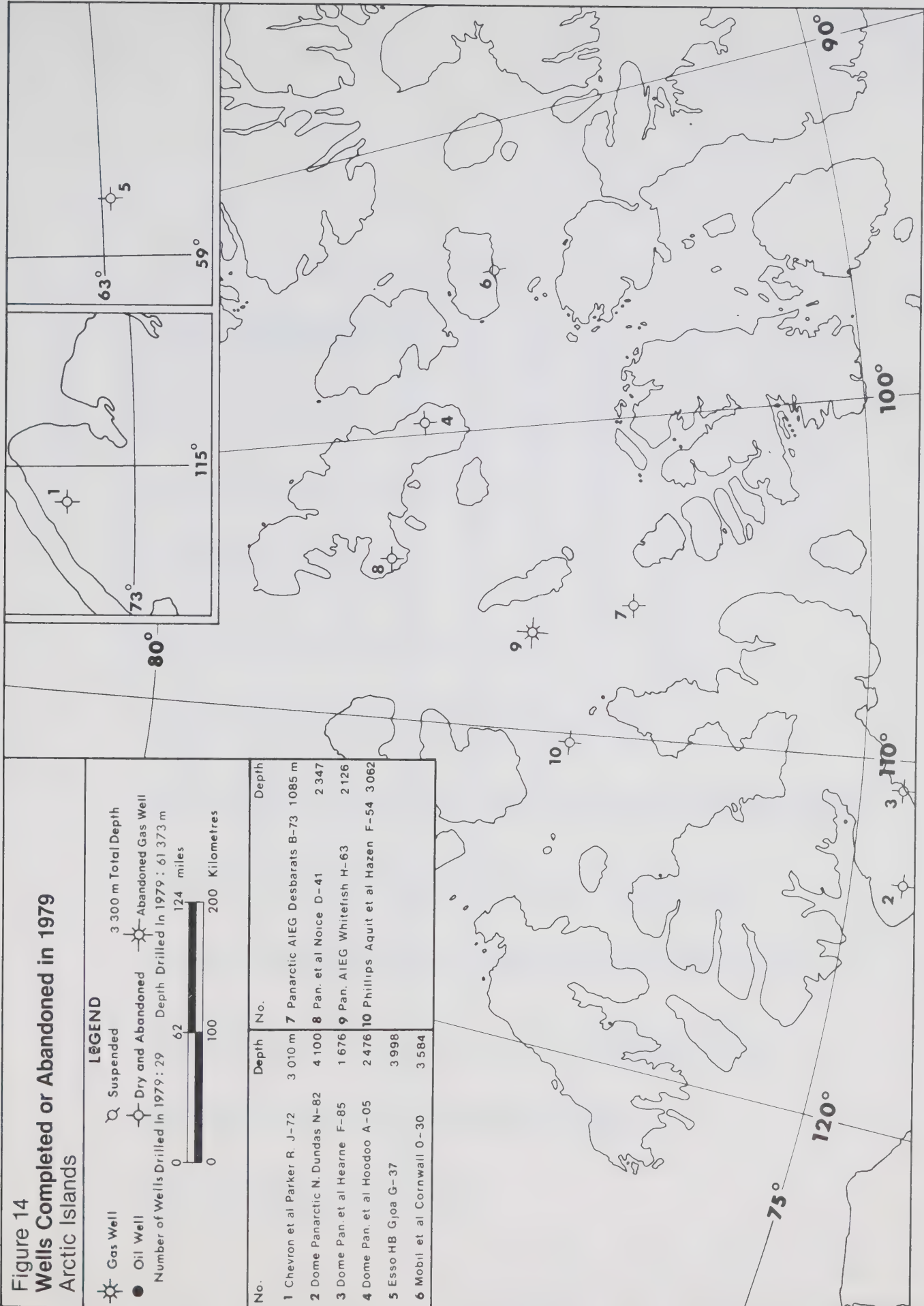
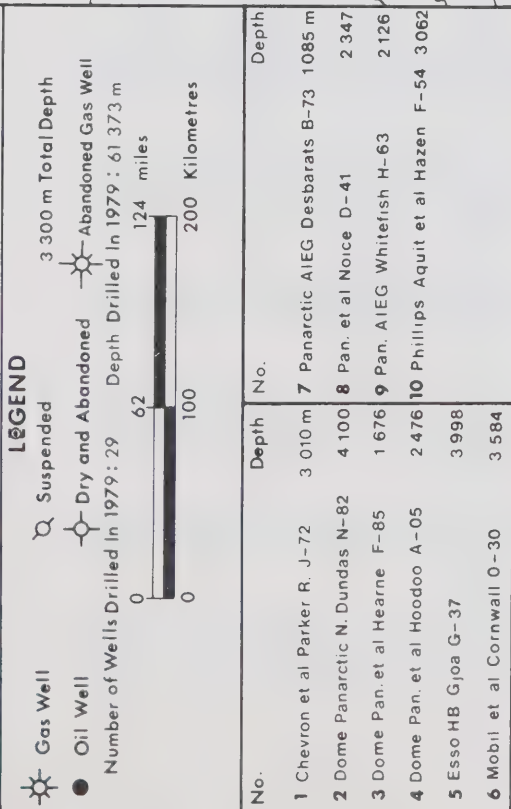


Figure 15  
**Wells Drilled**  
 Yukon Territory and Northwest Territories  
 Number of Wells Drilled to end 1979 = 947

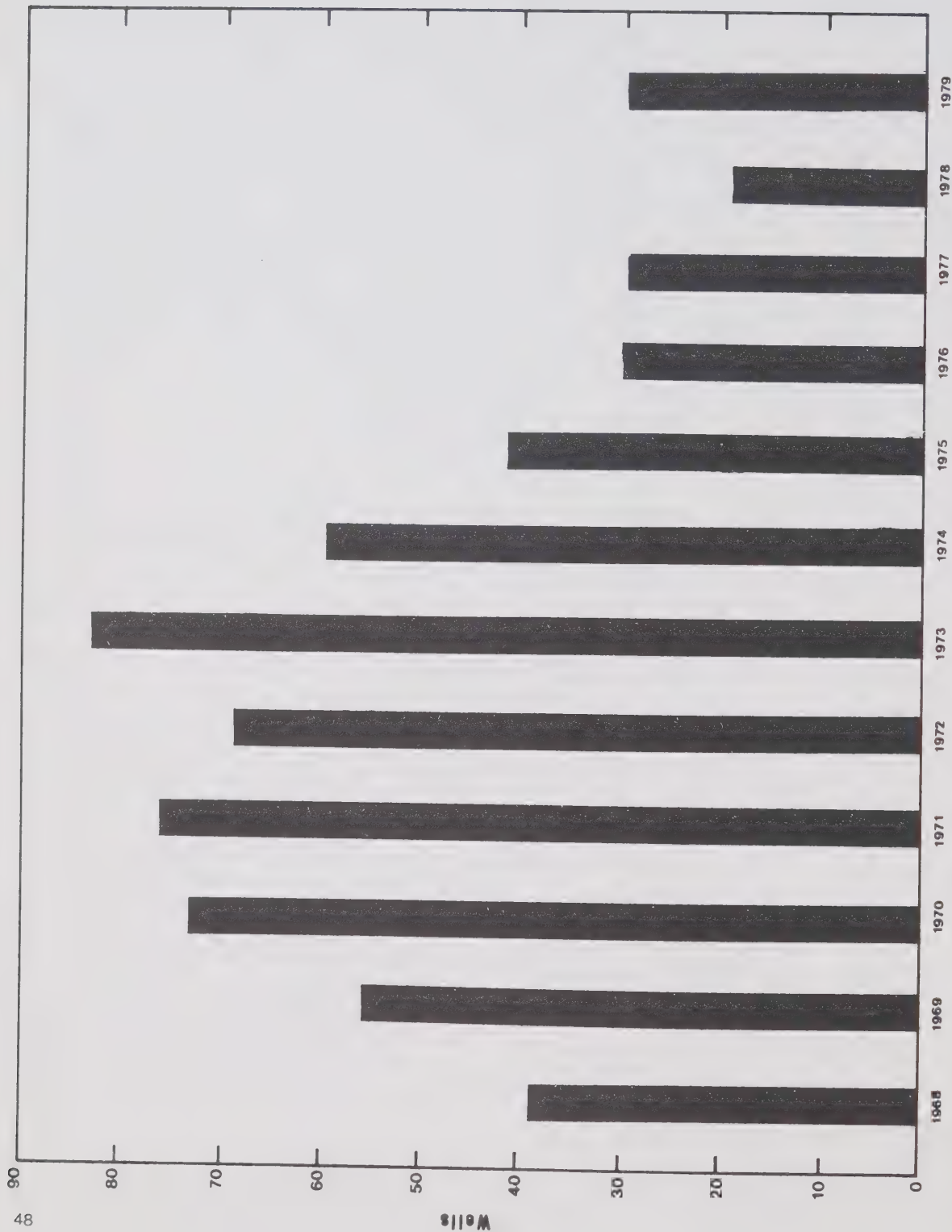


Figure 16  
**Depth Drilled**  
 Yukon Territory and Northwest Territories





# Net Cash Expenditures by Industry

**Table 9 - Net Cash Expenditures 1978 (Final)**  
(in thousands of dollars)

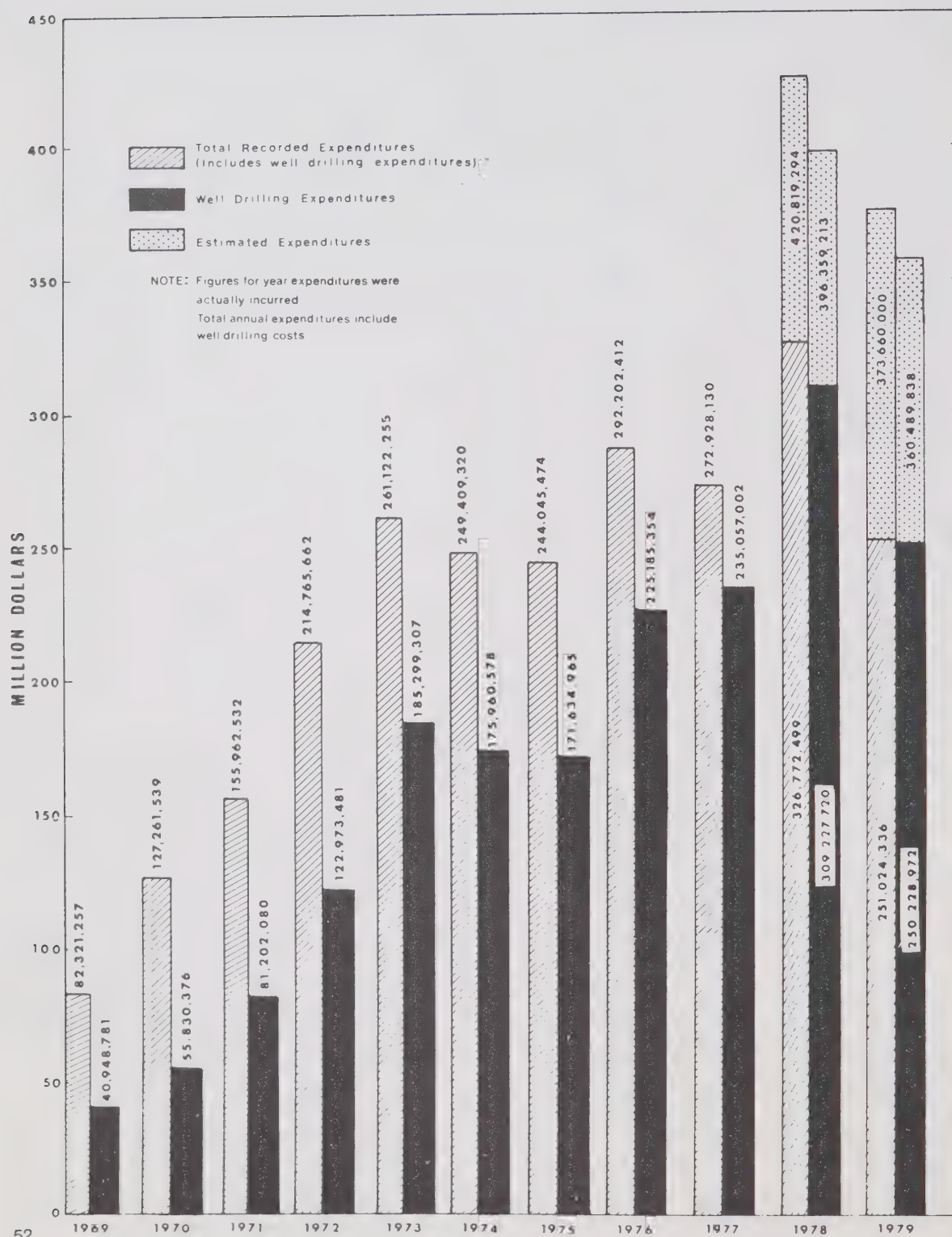
	<i>Offshore</i>			Yukon N.W.T. and Arctic Islands	Canada
	East Coast	Hudson Bay	West Coast		
<b>Geological and geophysical expenditures</b>					
(a) Seismic Crew expenses	7 260	-	-	17 763	241 255
(b) All other geological and geophysical expenses	11 859	12	-	24 364	260 644
<b>Land and lease acquisition and retention</b>					
(a) Permit fees and acquisition costs	3 265	-	-	33	887 252
(b) Non-producing acreage retention costs	159	-	-	4 609	92 556
(c) Producing lease and surface rentals	-	-	-	238	34 982
Exploratory drilling	69 587	-	-	373 977	1 237 522
Development drilling	-	-	-	22 382	624 905
<b>Other capital expenditures</b>					
(a) Tangible well and lease equipment	-	-	-	6 121	408 514
(b) Pipelines and related facilities	-	-	-	36	63 055
(c) Secondary recovery and pressure maintenance projects	-	-	-	106	56 582
(d) Natural gas processing plants	-	-	-	5 015	218 830
(e) All other capital expenditures	2 009	-	-	21 198	77 051
Field, well and pipeline operations	-	-	-	2 202	708 039
Natural gas plant operations	-	-	-	2 083	295 758
<b>Other operating expenditures</b>					
(a) Taxes (excluding income taxes)	27	-	-	192	121 716
(b) Royalties	-	-	-	4 344	3 338 358
(c) Interest expense	1 327	-	-	600	194 288
(d) Other	84	-	-	3 577	160 479
<b>Total</b>	<b>95 577</b>	<b>12</b>	<b>-</b>	<b>488 840</b>	<b>9 071 786</b>

Total expenditures, according to information compiled by the department, Statistics Canada and Industry are shown in Tables 9 and 10 and Figure 17. Gross industry expenditures north of 60° decreased over those of 1978 by approximately \$48 million to reach a total of \$441 million. Exploratory and development drilling expenditures decreased to \$360 million (down 9 per cent), while total geological and geophysical expenditures decreased to \$13 million, a 48 per cent decline from 1978. For the 1979 period expenditures on lands administered by Energy, Mines and Resources were \$236 million, an increase of \$140 million from the previous year.

**Table 10 – Net Cash Expenditures 1979 (Preliminary)**  
(in thousands of dollars)

	<i>Offshore</i>			Yukon N.W.T. and Arctic Islands	Canada
	East Coast	Hudson Bay	West Coast		
<b>Geological and geophysical expenditures</b>					
(a) Seismic Crew expenses	9 495	–	–	9 482	257 942
(b) All other geological and geophysical expenses	11 911	2	–	20 959	260 025
<b>Land and lease acquisition and retention</b>					
(a) Permit fees and acquisition costs	1 134	–	–	20	1 285 989
(b) Non-producing acreage retention costs	555	45	–	5 925	112 556
(c) Producing lease and surface rentals	–	–	–	117	39 318
Exploratory drilling	204 150	–	–	346 700	1 810 660
Development drilling	–	–	–	13 789	897 207
<b>Other capital expenditures</b>					
(a) Tangible well and lease equipment	1 944	–	–	6 591	521 194
(b) Pipelines and related facilities	–	–	–	–	54 599
(c) Secondary recovery and pressure maintenance projects	–	–	–	14 683	105 139
(d) Natural gas processing plants	–	–	–	3 100	301 873
(e) All other capital expenditures	5 655	–	–	5 359	116 792
Field, well and pipeline operations	38	–	–	7 023	967 863
Natural gas plant operations	–	–	–	1 171	350 741
<b>Other operating expenditures</b>					
(a) Taxes (excluding income taxes)	279	–	–	172	141 748
(b) Royalties	–	–	–	5 159	3 995 422
(c) Interest expense	–	–	–	309	322 136
(d) Other	401	–	–	226	174 073
<b>Total</b>	<b>235 524</b>	<b>47</b>	<b>–</b>	<b>440 785</b>	<b>11 715 277</b>

Figure 17  
Oil and Gas Exploration Expenditures  
Submitted for Work Credits





# Production, Processing and Refining

## Norman Wells Oil Field

The Norman Wells oil field, located in the west central part of the Northwest Territories, had 61 oil wells capable of production in 1979, with 33 producing regularly. Total gross field production during the year averaged  $388.6 \text{ m}^3/\text{d}$  of oil plus  $31.6 \cdot 10^3 \text{ m}^3/\text{d}$  of gas for a yearly total of  $141.9 \cdot 10^3 \text{ m}^3$  of oil and  $11.6 \cdot 10^6 \text{ m}^3$  of gas.

The only refinery in Canada located north of  $60^\circ$  is located at Norman Wells and is operated by Imperial Oil Limited. It has a calendar day capacity of  $508 \text{ m}^3$ . In 1979, the refinery processed an average of  $396 \text{ m}^3/\text{d}$  of locally produced crude oil. The total refinery output of all products during 1979 was  $135.9 \cdot 10^3 \text{ m}^3$ .

During the first half of 1979, Esso Resources was given approval for a scheme to enhance the oil recovery by waterflooding in the Mainland area of the pool. The project involved drilling five new wells and through them injecting water at a rate of  $2900 \text{ m}^3/\text{d}$  into a total of 17 wells. The water injection and distribution system will comprise an injection station and water lines traced to prevent freezing and enclosed in aboveground steel corridors. Water for injection purposes will be taken from the Mackenzie River. Benefits expected from the project are greater gas conservation, assurance of continued oil production to supply the Norman Wells refinery, and increased ultimate recovery from the pool. Total cost of the project is expected to be approximately \$8 million. Drilling and construction continued throughout 1979, and water injection is expected to commence in the first quarter of 1980.

Esso is also planning for full-scale development of the pool, including waterflooding of all areas of the pool. To this end three wells were drilled from ice platforms on the Mackenzie River to confirm the extension of the productive Kee Scarp reservoir beneath the river. Oriented cores were taken in all these wells to determine the orientation of the fractures which appear to exist throughout the reservoir and which could create a directional permeability trend. To further assist in the determination of this hypothesized permeability trend, a special injection test was conducted on Well 36X. Pressure response was monitored in offsetting wells.

As part of the preparation for an application to be submitted to the department in the first quarter of 1980, geological and reservoir engineering studies continued throughout the year to determine the best plan for development of the pool.

## Pointed Mountain Gas Field

In the Northwest Territories six gas wells – G-62, K-45, O-46, P-53, F-38 and A-55 in grid area 60-30-123-45 — produced gas at a combined gross average rate of  $1.65 \cdot 10^6 \text{ m}^3/\text{d}$  plus  $146 \text{ m}^3 \text{ water}/\text{d}$  for a yearly total of  $602.47 \cdot 10^6 \text{ m}^3$  of gas and  $53 \cdot 399 \text{ m}^3$  of water.

## Beaver River Gas Field

The Beaver River field, in the Yukon and British Columbia, has been depleted and no further production is expected.

### Kotaneelee Gas Field

The Kotaneelee gas field is located in the Yukon some 31.2 km southwest of the Pointed Mountain field and 19.3 km northeast of the depleted Beaver River field. Construction of a 64 km, 219 mm O.D. (outside diameter) gas gathering system and a gas dehydration facility with a capacity of  $1\,980\,10^3\text{m}^3/\text{d}$  was completed during early 1979. The gas is transported through the 580 mm Westcoast Transmission Company Pointed Mountain trunk line to the Clarke Lake sour gas processing plant at Fort Nelson. The gas at Kotaneelee contains 2.44 per cent hydrogen sulfide and 16.99 per cent carbon dioxide, both of which are removed at Fort Nelson.

During 1979 a total of  $23\,648\,10^3\text{m}^3$  of gas and  $1\,771\,10^3\text{m}^3$  of water were produced from the Nahanni formation in the H-38 well. All water production is reinjected into the Mattson zone in the M-17 disposal well. Neither the I-27 well, completed during 1964, nor the E-37 well, completed during 1979, is capable of producing at a high enough rate to justify tie-in to the gathering system. Drilling of a new well, I-48, was begun during 1979 to further delineate the field and to increase field productivity.

Columbia Gas, the operator of the Kotaneelee field, was only able to negotiate a *best effort* contract with the purchaser of the gas, Westcoast Transmission Company. This would have resulted in large daily variations in demand with little if any gas sales during the summer months. Consequently, Columbia Gas made an application to the National Energy Board for the export of natural gas to the United States. The company applied for a permit to export  $5\,779\,10^6\text{m}^3$  over a 15-year period with an average daily volume of  $1\,161.4\,10^3\text{m}^3$  and an annual volume of  $385.3\,10^6\text{m}^3$ .

Under the proposal, the gas would be transported through Westcoast's facilities to those of the Northwest Pipeline Corporation. On entering the United States, the gas would be delivered through exchange agreements, to the eastern market served by Columbia's parent, Columbia Transmission.

In November 1978 the National Energy Board rendered its decision on this and other export applications, and authorized exports from Kotaneelee totalling  $2\,394\,10^6\text{m}^3$  over an eight-year period commencing January 1, 1980. For the period January 1, 1980 to December 31, 1984, daily volumes would have been limited to  $1\,110\,10^3\text{m}^3$  and annual volumes to  $368.3\,10^6\text{m}^3$ . No exports would have occurred until the National Energy Board had been satisfied that all requisite contracts for the purchase and transportation of the gas had been executed.

However, the United States government rejected the Columbia Gas application to import gas and, therefore, production in 1980 from the Kotaneelee field will be subject to the *best effort* contract of Westcoast Transmission Company.

# Pipelines and Development Projects

## Alaska Highway Gas Pipeline Project

Applications supporting submissions by all participants were filed before the Federal Power Commission in the United States and National Energy Board in Canada in the summer and fall of 1976.

The decision not to build the Mackenzie Valley pipeline, at present, was made in 1977 and, in September of that year, Canada and the United States signed an agreement to allow the construction of a natural gas pipeline for the transport of gas from Prudhoe Bay, Alaska, to the lower 48 states. Figure 18 shows roughly the proposed route. Under the agreement, a spur line from the Mackenzie Delta area (the Dempster lateral) could, if required or desired, be built. Alberta Gas Trunk Line Company Ltd. and Westcoast Transmission Company Ltd. are the sponsors of the Canadian sections, and the parent company, Foothills Pipe Lines (Yukon) Ltd., completed its corporate restructuring by the incorporation of six federal subsidiaries.

The 1 177 km of 1 200 mm mainline pipe in Alaska is the responsibility of Northwest Pipeline Company of Salt Lake City, Utah. South of the 49th parallel, Northern Border Pipeline Company, a consortium of United States transmission companies, will construct the eastern leg of the system. Two California companies Pacific Gas Transmission and its parent corporation, Pacific Gas and Electric, will construct the western leg.

Through an Act of Parliament in April 1978, a new Northern Pipeline Agency was created to provide a single regulatory authority to undertake federal responsibilities for planning and monitoring construction of the pipeline system in Canada.

The initial capacity of the system is estimated as capable of carrying up to  $67.2 \times 10^6 \text{ m}^3$  of United States gas daily and  $33.6 \times 10^6 \text{ m}^3$  of Canadian gas.

Based on Foothills objective of achieving some 90 per cent input of Canadian goods and service in the project in this country – including the Dempster lateral – it is estimated that 100 000 man-years of employment would be created in Canada, directly as a result of the project and indirectly as a result of further economic activity generated by pipeline outlays. Excluding the Dempster lateral, the total man-years are estimated at approximately 68 000.

Under the Canada – United States Agreement, a start on pipe-laying could not commence in the Yukon before January 1, 1981. Target date for commencement of system operations is currently 1985.

*The route and distances of the northern pipeline are as follows:*

From Prudhoe Bay, Alaska, flanking the Alyeska line southward to Fairbanks and southeast along the route of the Alaska Highway to the Alaska-Yukon border: 1 177 km.

From the Alaska border to Whitehorse in the Yukon (connecting point for the proposed 1 187 km lateral to the Mackenzie Delta), entering northeast British Columbia near Watson Lake and continuing southeast to enter Alberta near Boundary Lake and from there to James River near Caroline. Here the line would divide into a western leg to Kingsgate, B.C. and an eastern leg to Monchy, Saskatchewan. Total distance in Canada including the Dempster lateral: 4 452 km.

In the lower 48 states, the western leg to California will be provided through looping of the existing system operated by Pacific Gas Transmission Co. and Pacific Gas and Electric Co., and the eastern leg to midwestern states will be constructed by the Northern Border Co. Total length: 3 206 km.





Esso Issungnak artificial island under construction in the Beaufort Sea.

Total length of the system through Canada and the USA, including the Dempster lateral: 8 834 km.

At the 1979 value of the United States dollar, estimated costs of the Foothills facilities amount to:

United States	\$10.5 billion
Canada, excluding the Dempster lateral	5.0 billion
Total cost	\$15.5 billion

### Dempster Lateral Gas Pipeline

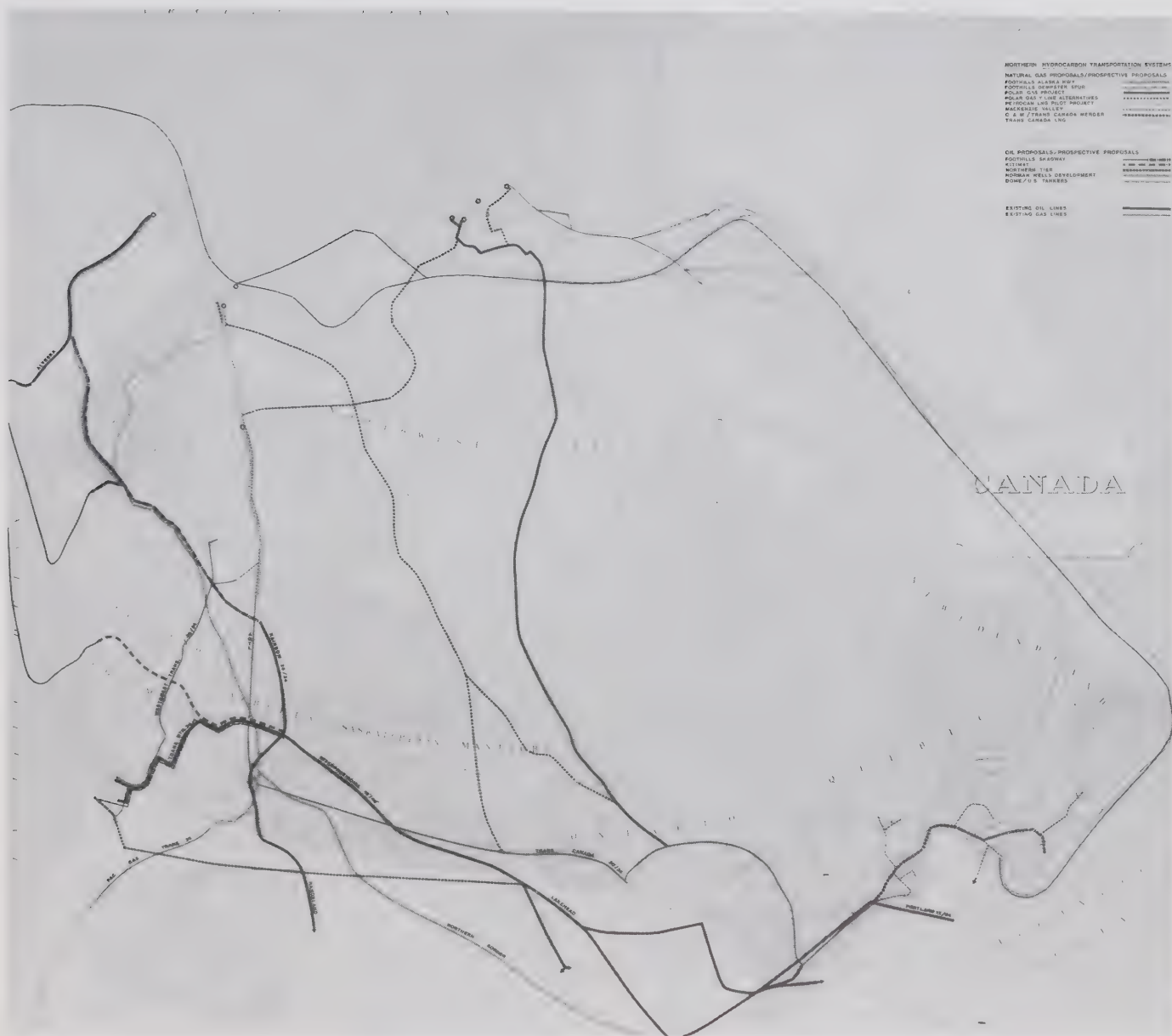
Foothills Pipe Lines (Yukon) Ltd. has filed its application with the National Energy Board and the Department of Indian Affairs and Northern Development to build the Dempster lateral gas line and to meet the July 1, 1979 deadline set by the federal government.

The lateral will extend 1 201.6 km from the Mackenzie Delta area to a point on the Alaska Highway gas pipeline about 80 km west of the intersection of the Alaska and Klondike highways near Whitehorse. It will include two spurs to connect the Niglintak and Parsons Lake fields. The cost is estimated at \$2.5 billion escalated to completion in fall 1987. Construction is expected to start in 1985 with the first gas moving in January 1987.

The plan calls for pipe 864 mm in diameter with an 11.13 mm wall thickness and an operating pressure of 9 930 kPa. The gas will be chilled to below 0°C for about 700 km of the northern portion to protect the permafrost. The capacity of the line will be 34 10<sup>6</sup>m<sup>3</sup>/d with eight compression and chilling stations. Total compression power will be 171 700 kW.

The application, whose preparation cost close to \$5 million, stated that, due to the long lead time before construction, uncertainty of future energy pricing and reluctance of Delta producers to do further exploration and development without the assurance of a pipeline, it has not been possible to include gas purchase contracts, transportation agreements or definitive evidence of financing. Adding to this uncertainty is the fact that the Alaska Highway gas pipeline has not yet been financed.

### Figure 18 Northern Pipelines



The application also included consideration of the possible expansion of and addition to the facilities needed on the Alaska Highway gas pipeline to carry gas from the Mackenzie Delta. These would comprise 10 new compressor stations, plus additions to 13 others, for total additional power of 369 780 kW.

### **Polar Gas Project**

The Polar Gas Group, managed by Trans Canada Pipelines Ltd. was formed early in 1972 to investigate the feasibility of a natural gas pipeline from the Arctic Islands to southern markets. During 1979, it continued research and investigation into the construction and operation of such a line. On December 21, 1977, it filed an application with the National Energy Board and the Department of Indian Affairs and Northern Development for the necessary approvals to construct a 3 765 km pipeline, including 143 km of marine crossings. The estimated cost of this project is \$6.1 billion in 1976 dollars.

The proposed route would run from the Drake Point and Hecla natural gas fields on Melville Island, across Byam Channel, Byam Martin Island and Austin Channel to Bathurst Island, across Bathurst Island, Little Cornwallis Island, Cornwallis Island and Barrow Strait to Somerset Island to reach the most northerly point of the mainland at the tip of Boothia Peninsula on the south of Bellot Strait. It would then run south through the District of Keewatin, N.W.T., to enter Manitoba north and west of Churchill, would cross Manitoba, enter Ontario just east of Kistigan Lake and continue southeast to terminate at an interconnection with the Trans Canada pipeline system near Longlac, Ontario.

On December 1, 1978, during testimony before the Natural Gas Supply/Demand hearing of the National Energy Board in Ottawa, Polar Gas advised that, as a result of recent technological advances in deep marine pipe-laying, they were making a preliminary examination of a new routing via M'Clure Strait and Victoria Island onto the mainland near Coppermine and then southeastward to join the existing Trans Canada pipeline system.

On June 26, 1979, Polar Gas advised the National Energy Board it had determined that crossing of M'Clure Strait is technically feasible and that it planned to complete studies of a combined pipeline system (Y-line) before the end of 1979. This combined system would connect the reserves of both the Arctic Islands and the Delta - Beaufort Sea areas to southern markets. Specific details of the line size, operating pressure, capacity and cost estimates have not yet been revealed. Figure 18 shows the route applied for and the proposed Y-line.

Polar Gas has stated that the threshold reserves required to justify the contemplated large-diameter pipeline would be in the range of  $423\text{--}563 \times 10^9 \text{m}^3$ . According to the National Energy Board report *Canadian Natural Gas - Supply & Requirements*, dated February 1979, the total established reserves in the Mackenzie Delta-Beaufort Sea and Arctic Islands area is  $409 \times 10^9 \text{m}^3$ .

### **Petro-Canada Arctic Liquefied Natural Gas (LNG) Pilot Project**

An application was filed with the National Energy Board in January 1979 requesting approval of a combined pipeline and LNG tanker project to move a daily average volume of  $7.065 \times 10^6 \text{m}^3$  of gas from Melville Island to an East Coast port. The following information outlines the main aspects of this program.

#### **General**

Project partners: Petro-Canada; Alberta Gas Trunk Line Co. Ltd. (AGTL); Melville Shipping Ltd.

Cost of project: \$1.0 billion, excluding field development (1977 dollars)

Date of application to the National Energy Board to export gas: January 17, 1979

Development time and money spent to date: Two years and \$11 million

Construction time: Four years (10 000 man-years for ships; 13 000 man-years for other)

Project life: 20 years



Ownership: Panarctic Oils Ltd. 100%.  
Field location: Drake Point Field, Melville Island,  
N.W.T.  
Field gas reserves: 156 10<sup>9</sup>m<sup>3</sup>  
Gas reserves required for project: 54 10<sup>9</sup>m<sup>3</sup>  
Cost of field development: \$80 million (1977 dollars)  
Number of wells: Eight onshore wells  
Operating staff: 21

Ownership: Petro-Canada 55%; AGTL 45%  
Length: From field to Bridport Inlet – 160 km  
Diameter: 56 cm  
Pipeline cost: \$93 million (1977 dollars)  
Operating staff: six

Ownership: Petro-Canada 55%; AGTL 45%  
Location: Bridport Inlet, southern coast, Melville Island, N.W.T.  
Terminal costs: \$455 million (1977 dollars)  
Length of main pier: 600 m  
Terminal storage capacity: 200 000 m<sup>3</sup>, barge mounted  
Operating staff: 54

Ownership: Petro-Canada 33%; AGTL 27%; Melville Shipping Ltd. 40% (Partners in Melville Shipping are Federal Commerce and Navigation Ltd., Upper Lakes Shipping Ltd., Canada Steamship Lines (1975) Ltd.)  
Number of ships: Two  
Classification: Arctic Class 7 icebreakers  
Length of ships: 375 m  
Beam of ships: 43 m  
LNG capacity for each ship: 140 000 m<sup>3</sup>  
Power level: 150 MW – gas turbine electric (five times that of standard LNG carriers of comparable size)  
Propulsion: three fixed pitch propellers per ship  
Length of voyage: 33-day round trip in winter  
16-day round trip in summer  
Cost of two LNG carriers: \$422 million (1977 dollars) each  
Operating staff: 42 per crew (four crews)

Ownership: Petro-Canada 55%; AGTL 45%

Three possible locations: Lorneville, New Brunswick  
Strait of Canso, Nova Scotia  
St. Lawrence River, Quebec

Terminal costs: \$93 million (1977 dollars)

Terminal storage capacity: 200 000 m<sup>3</sup> in two tanks

Operating staff: 15

It is proposed that the LNG be regasified at one of the three prospective terminal points and distributed to eastern Canadian customers via a new distribution pipeline. By displacement, additional gas would be available for export to United States markets from Alberta.

Development of the project, including the supporting marine transport elements, would be considered as a pilot project to test the technical and economic viability of production and transportation of gas from the Arctic Islands.

Interprovincial Pipelines has made application to the National Energy Board for permission to build a single, 300 mm pipeline from Norman Wells to carry crude oil to northern Alberta where connecting pipelines would transport it south. No date or place has yet been set for the hearings, which are expected to be lengthy. However, Interprovincial Pipelines estimates that if the necessary approval is received before the fall of 1980, the line could be completed by 1983.

# Surveys and Studies



*Canmar Supplier V at work in the Beaufort Sea.*

The number of participation and research projects was less in 1979 than in the previous year, although two new projects were started. Expenditures incurred for these projects qualify for work credits and, when approved, can be applied to permits in designated approved areas. Major programs in these categories in 1979 included the following:

## **Geophysical Surveys**

Eureka Exploration Ltd. carried out a 144-km seismic reconnaissance program in the Beaufort Sea.

Geophysical Services Inc. carried out a 355-km marine seismic reconnaissance program in the Beaufort Sea.

## **Research Programs**

Arctic Petroleum Operators Association (APOA) continued its heavy investment of effort and money in environmental and engineering research projects in the Far North.

## **Eastern Arctic Marine Environmental Studies**

In November 1977, the Minister of Indian Affairs and Northern Development announced the setting up of a study program for the offshore areas of the eastern Arctic. Its objective is to provide sufficient environmental impact data on which decisions for the granting or withholding of exploratory drilling permits at sites in the area can be made. The program is known as the Eastern Arctic Marine Environmental Studies (EAMES) and covers the area indicated in Figure 19. The waters off the east coast of Baffin Island are of principal interest in that they overlie formations considered potentially high in oil and gas.

Before drilling is permitted it was considered essential that the environmental conditions and constraints be determined in order to protect all segments of the ecology and to ensure that adequate techniques, safeguards and remedies are known and available to cope with any possible disturbances or emergencies that drilling might create. This was the first time the initial approach to the exploration of a region involved the studying of its total ecology as a whole rather than limiting research to the environment of a specific area.

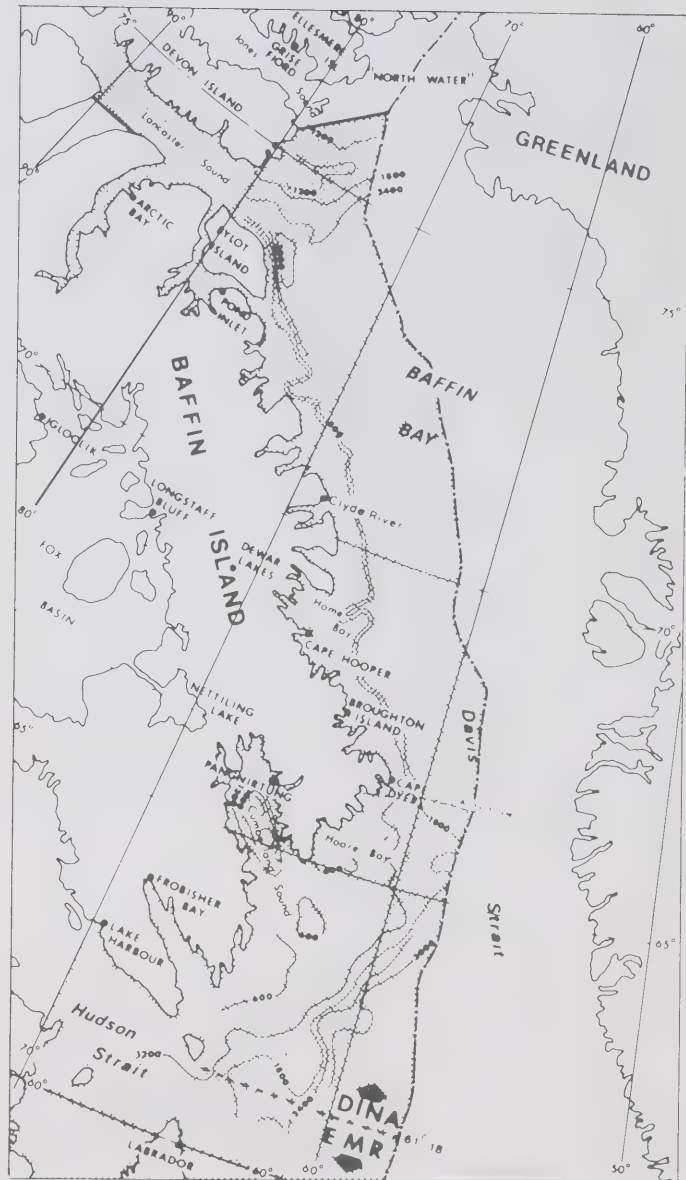
Figure 19  
**Eastern Arctic Marine Environmental Study  
 Area (EAMES)**  
 (Shading indicates survey area)

The most vital areas are Lancaster Sound, Baffin Bay and Davis Strait. The research is expected to take four years, but in view of the urgent need for oil, every effort is being made to reduce this time. Most studies by industry have already been completed.

Three federal departments, Energy, Mines and Resources, Environment, and Indian Affairs and Northern Development, are involved. The management committee is chaired by a representative from Indian Affairs and Northern Development, but the actual work is the responsibility of industry. The federal departments, of course, co-operate by providing any facilities or studies they alone can give. As much use as possible is made of the local Inuit knowledge and skills and the native people of the eastern Arctic are included and actively involved in the planning and conduct of the studies. In addition to four specialists familiar with the coastal and offshore environment and two representatives of the petroleum industry, the Advisory Board set up to assist the management committee also includes local and native representatives from 10 communities in the area.

All environmental elements of the area are included in the program, land aspects as well as marine: wildlife, climate, freshwater and saltwater areas, the shallow as well as the deep sea-waters, ice conditions, waves and currents, the effects of possible oil spills, the techniques to be developed to deal with them, and any other aspect that may, in the course of the study, be found to be relevant. The program is being jointly funded by the federal government and industry, with industry's share being the largest. Costs are anticipated to be well in excess of \$12 million (in 1977 dollars).

In 1979, emphasis was on the completion of the projects started under EAMES in 1978. The projects dealt mainly with ice mechanics and ice defence systems research. Esso Resources, Aquitaine and other operators completed major environmental research projects in Baffin Bay as a requirement for their application for drilling authorities.





### **Lancaster Sound Regional Study**

In response to a 1977 application by Norlands Petroleum Ltd. for a drilling authority in Lancaster Sound, the Federal Environmental Assessment Review Office established a panel to hold public hearings to identify the various potential resource-use conflicts.

In its report to the Minister of the Environment, the panel concluded that the combination of physical characteristics, biological uniqueness and logistical problems would demand an ultra-conservative approach to drilling in the area.

The many inadequacies in the information presented and in the preparations proposed by the oil company led the panel to recommend that drilling be deferred until these deficiencies could be corrected. The panel further concluded that a much broader review was needed for the present and future uses of Lancaster Sound, in order to avoid committing the Department of Indian Affairs and Northern Development to a course of action prejudicial to the optimum conservation and utilization of all resources in the area. Specifically, it was recommended that the department, as the responsible federal co-ordinating and planning body, *address, with adequate national and regional public input and taking into account the various forces at work, the best use(s) of the Lancaster Sound Region.*

Following the recommendations of the panel, a Lancaster Sound Regional Study was initiated with the object of producing a green paper. (A green paper is intended to provide a clear description of the issues in question and to outline a range of options available for their resolution.)

In the context of the present Lancaster Sound Regional Study, the green paper is a tool for bringing about organized and thorough discussion on the optimum future uses of the marine and land areas by the residents of the Lancaster Sound region, interested organizations, and concerned members of the public.

An interdisciplinary working group has been assembled from staff of five federal government departments and from the government of the Northwest Territories to conduct the study and produce a draft green paper.

The present plans call for the Lancaster Sound green paper to be released in February, 1981.

# Appendix I

## Sources of Information

### Publications

#### Maps

Many maps dealing with the northern resource activities are published by the Northern Non-Renewable Resources Branch, Department of Indian Affairs and Northern Development (DINA) and are available from the Oil and Gas Exploratory Operations Section, Calgary, Alberta, or from the Director, Northern Non-Renewable Resources Branch, Ottawa. The Branch publishes a list of maps which may be obtained without charge from either of the above sources.

#### Reports

The following reports may be obtained from Supply and Services Canada, Printing and Publishing. Pre-payment is required.

Schedule of Wells 1976	\$ 5.00
Schedule of Wells 1977	5.00
Schedule of Wells 1921-1979	35.00 (in press)
Oil and Gas Statistical Report No. 2 (1921-1972)	5.00

Technical Reports Available for Inspection 1921-80 (Geological and geophysical reports released from confidential status are available for public inspection only in the office of the Oil and Gas Exploratory Operations Section of DINA in Calgary) - No charge.

### Other Sources of Information

Information on northern resource activities may be obtained from the Director, Northern Non-Renewable Resources Branch, Department of Indian and Northern Affairs, Ottawa, Ontario. Cores and samples from wells drilled on Canada lands north of 60°N. latitude, except the Baffin Bay-Davis Strait region, are stored at the Institute of Sedimentary and Petroleum Geology, 3303-33rd St. N.W., Calgary, Alberta. Cores and samples from wells drilled in the Baffin Bay-Davis Strait region are stored at the Atlantic Geoscience Centre, Box 1006, Dartmouth, Nova Scotia. Such samples and cores for wells as have been released from confidential status pursuant to the Canada Oil and Gas Land Regulations and the Canada Oil and Gas Drilling Regulations may be inspected at these locations. Further, one set of samples is stored under the auspices of the Regional Oil and Gas Conservation Engineer, at the DINA Corehouse in Yellowknife. A list of such wells may be obtained from the Director, Northern Non-Renewable Resources Branch. Specialized and technical literature pertaining to northern Canada may be obtained from the following:

**Department of Indian Affairs and Northern Development**

- (1) Departmental Library, 10 Wellington St. Hull, Quebec
- (2) Oil and Gas Exploratory Operations Section, Department of Indian Affairs and Northern Development - Calgary, Alberta

**Department of Energy, Mines and Resources**

- (1) Geological Survey of Canada - Ottawa, Ontario and Vancouver, British Columbia.
- (2) Institute of Sedimentary and Petroleum Geology - Calgary, Alberta.
- (3) Atlantic Geoscience Centre, Bedford Institute of Oceanography - Dartmouth, Nova Scotia.
- (4) Pacific Geoscience Centre, Patricia Bay Institute of Ocean Sciences - Sidney, British Columbia.
- (5) Earth Physics Branch - Ottawa, Ontario.

**Department of National Defence**

Research and Development, Scientific Information Service - Ottawa, Ontario.

**Transport Canada**

- (1) Canadian Coast Guard - Ottawa, Ontario.  
Branches - Aids and Waterways  
- Fleet Systems  
- Ship Safety  
- Coast Guard Emergencies  
- Telecommunications and Electronics  
Branch, Edmonton, Alberta and Ottawa, Ontario.
- (2) Civil Aviation Branch - Winnipeg, Manitoba.

**Arctic Institute of North America -**  
Calgary, Alberta.

**National Research Council of Canada -**  
Ottawa, Ontario.

**Public Libraries**

The following brochures published by the Department of Indian Affairs and Northern Development may be available in some public libraries:

- i. Guide to Northern Non-Renewable Resources
- ii. Communication and Transportation Facilities  
Queen Elizabeth Group - Arctic Islands
- iii. Resources Management Division - Responsibilities and Administration
- iv. Oil and Gas Canada Lands - Volume No. 2
- v. Oil and Gas Canada Lands - Edition No. 3
- vi. Oil and Gas in the Yukon and Northwest Territories - Edition No. 4 - 1967
- vii. Oil and Gas - North of 60° - (annual editions 1968-1978)
- viii. Prospectus - North of 60°
- ix. Procedures, Licensing, Legislation & All That

**Information and Procedures Concerning Operations of Canada Lands**

Certain federal agencies are concerned with exploration of Canada lands and must be notified prior to the commencement of any exploration activity. The operator or permittee, not the contractor, is responsible for providing the requisite advance notice of planned programs to these agencies by writing directly to them.



For offshore programs, the Northern Non-Renewable Resources Branch, DINA, as well the Director, Northwest Territories Region, Northern Affairs Program, DINA at Yellowknife, Northwest Territories, must be informed with respect to each program. He will communicate with every department and agency on a need-to-know basis with respect to Marine Geophysical Programs. In the case of the Hudson Bay region, operators must also inform the National Research Council of Canada of proposed operations to be undertaken during the summer months.

Circumstances may be such that other agencies should be notified as well, and these are listed on the following pages, together with the names of persons who can be of assistance. For example, since operators are responsible for any damage they may cause to underwater commercial cables, it is recommended that they contact the Canadian Hydrographic Service for cable-lay data covering the area over which the work is to be performed. Similarly, the Department of National Revenue, Customs and Excise should be contacted by the importing company if vessels or equipment are to be brought in from abroad.

Information in the brochure *Communication and Transportation Facilities Queen Elizabeth Group Arctic Islands*, is being updated and will be available in a comprehensive report entitled *Operational Guide for Oil and Gas Companies* in the North. This publication is now in preparation. In addition to information concerning communication and transportation, the report will contain information covering all aspects relating to exploration in the North.

Information in the brochure *Procedures, Licensing, Legislation & All That* outlines some of the procedures and requirements regarding northern natural resource development. Copies may be obtained from the Regional Directors in Yellowknife and Whitehorse.

### **Department of Indian Affairs and Northern Development**

Pursuant to Section 52 of the Canada Oil and Gas Land Regulations, Notice of Commencement of Exploratory Work must be filed:

- 15 days prior to the commencement of proposed exploratory programs (geophysical, geological and research) on the mainland Northwest Territories, in the Arctic Islands and in the Yukon Territory.
- 45 days prior to commencement of geophysical work in offshore areas with the:

Oil and Gas Exploratory Operations Section,  
Northern Non-Renewable Resources Branch,  
Department of Indian Affairs and Northern Development,  
P.O. Box 2638, Station "M",  
CALGARY, Alberta  
T2P 3C1.

Information and assistance may also be obtained from:

Director,  
Northern Non-Renewable Resources Branch,  
Department of Indian Affairs and Northern Development,  
OTTAWA, Ontario K1A 0H4  
Name: Dr. H.W. Woodward  
Phone: 819-997-9339  
Telecopier: 819-997-9542

or from:

Chief,  
Oil and Gas Lands Division,  
Name: P. Sullivan  
Phone: 819-997-9741

Advice on specific oil and gas rights and oil and gas title matters may be obtained from:  
Land Manager,  
Oil and Gas Land Rights Section,  
Name: J.A.S. Barrett  
Phone: 819-997-0877

Advice on exploratory programs and operational matters may be obtained from:  
Head,  
Oil and Gas Exploratory Operations Section,  
Name: S.A. Kanik  
Phone: 819-997-9444

Drilling authority and advice on drilling matters can be obtained from the Regional Conservation Engineer for the appropriate Region.

Oil and Gas Engineering Division  
Chief Petroleum Engineer – Appointment pending  
Head, Drilling and Completion Engineering Section – M.K. El-Defrawy  
Head, Production Systems Engineering and Special Projects Section – I.M. Feldman  
Head, Pipelines and Transportation Engineering Section – T.G. Starr  
A/Head, Reservoir Engineering Section – J.D. Boggs  
Regional Oil and Gas Conservation Engineer, N.W.T. – M.D. Thomas  
Oil and Gas Conservation Engineer, N.W.T. – D.R. Whitehead  
Yellowknife,  
N.W.T.  
403-920-8175

A land use permit must be acquired for every land use operation, including drilling operations. A water licence or water authorization is required for all water use in accordance with the Northern Inland Waters Act and Regulations. Advance notice of 90 days is required before the start of drilling operations and all seismic activities, including marine seismic surveys involving the use of high explosives, in the event that qualified observers are needed. Notice of 45 days to the Regional Director is required before the start of a seismic survey in which a source of acoustical energy, other than high explosives, is to be used.

Information and advice on the Land Use Regulations, Land Use Permits and water use authorization may be obtained:

For the Northwest Territories:  
Director,  
Northwest Territories Region,  
Northern Affairs Program,  
Department of Indian Affairs and Northern Development,  
P.O. Box 1500,  
YELLOWKNIFE, N.W.T. X0E 1H0  
Name: R. Hornal  
Phone: 403-920-8111

For the Yukon Territory:  
Director,  
Yukon Territory Region,  
Northern Affairs Program,  
Department of Indian Affairs and Northern Development,  
200 Range Road,  
WHITEHORSE, Y.T. Y1A 3V1  
Name: D. Watson  
Phone: 403-668-5151

**Department of Energy, Mines and Resources,  
Resource Management Branch**

The Resource Management Branch is responsible for the administration of federal interests in the mineral resources off Canada's east and west seacoasts and in the Hudson Bay and Hudson Strait regions.

As a general rule all correspondence should be addressed to:

Dr. D.G. Crosby,  
Director General,  
Resource Management Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E4

The Branch may be reached by:

Telephone: (613) 995-9351

Telex: 053-4366

Telecopier: 996-5707

The Mineral Rights Division of the Branch, through the issuance of exploration permits and production leases, makes available rights to mineral development on all Canada lands in the offshore excluding the High Arctic; and ensures that holders of such terminable grants fulfill the terms and obligations stipulated in the regulations in order to maintain their interests in good standing.

Advice and assistance on matters relating to the disposition and administration of mineral rights, such as the issuance and terms of permits and leases and expenditures allowable for credit against permit or lease work obligations, may be obtained from:

D.L. Tough,  
Director,  
Mineral Rights Division,  
Resource Management Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E4

The Resource Geology Division of the Branch evaluates geological and geophysical information submitted by offshore operators, and assesses the mineral resource potential of prospects and specific areas in Canada's offshore regions, as well as for federally-owned mineral rights in the Provinces, for resource management purposes. The Division is also responsible for the handling and curation of lithologic and paleontologic material from offshore wells, and for the assembly and maintenance of a data bank of geological and geophysical information from the offshore.

Requirements and procedures with regard to the submission, confidentiality and subsequent examination of geophysical and geological data, including well materials, as well as sources of geological information and related matters, may be obtained from the office of:

D.F. Sherwin,  
Director,  
Resource Geology Division,  
Resource Management Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E4

The Operations and Conservation Division of the Branch exercises regulatory control over all activities associated with exploration, drilling, production and conservation of offshore oil and gas. This control includes the analysis of operational hazards, of proposed equipment and installations in the offshore and the nature and economic potential of reservoirs. Operators must meet the requirements of the Division regarding the safety of personnel, the protection of the environment, the prevention of pollution and waste, and the conservation of resources.



Assistance on such operational matters as the drilling, testing, completion or plugging of offshore wells; offshore structures; geophysical surveys; reporting requirements; pollution contingency plans; offshore environmental and feasibility projects; and the availability of reports after their release from confidential status may be obtained from the office of: Director,  
Operations and Conservation Division,  
Resource Management Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E4  
Name: G.R. Yungblut  
Phone: (613) 995-9351  
After hours: (613) 722-9286

or from other engineers in the Division including:  
F.H. Lepine,  
Head,  
Drilling and Operations Section  
Department of Energy, Mines and Resources,  
Phone: (613) 995-9351

On the East Coast, information and assistance on operational matters in the Maritimes Region and facilities for the examination of well materials, and exploration and assessment reports for all of the East Coast, is available from the Branch's Maritime Regional Office in Dartmouth:  
Offshore Manager – Maritime Region,  
Resource Management Branch,  
Department of Energy, Mines and Resources,  
Bedford Institute of Oceanography,  
P.O. Box 1006,  
DARTMOUTH, Nova Scotia B2Y 4A2  
Name: T.W. Dexter  
Phone: (902) 426-3179  
After hours: (902) 477-5886

In St. John's, Newfoundland, information and assistance on operational matters in the Newfoundland Region is available at the Branch's Newfoundland Regional Office.

Offshore Manager – Newfoundland Region,  
Resource Management Branch,  
Department of Energy, Mines and Resources,  
P.O. Box 127, Station "C",  
ST. JOHN'S, Newfoundland A1C 5H5  
Name: D. Hunt  
Phone: (709) 737-2125  
After hours: (709) 753-3368

The Environmental Assessment Division of the Branch assesses the environmental and sociological consequences of offshore mineral resource activity to ensure that projects are environmentally safe, and socially and economically acceptable to the region's coastal communities.

The Division's responsibilities include: the evaluation of weather, sea and ice conditions in operational areas; the assessment of the effects of offshore operations on the marine and coastal biota; the approval of oil spill contingency plans submitted by industry; and the promotion of environmental research such as the Offshore Labrador Biological Studies (OLABS) Programme.

For further information contact:  
Mr. Bell, Director,  
Environmental Assessment Division,  
Resource Management Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E4

### **Surveys and Mapping Branch**

Information on the systems, methods and equipment used for positioning and surveying of exploration work may be subject to review by this agency. Moreover, legal surveys must be made in accordance with instructions of the Surveyor General.

Enquiries concerning surveying may be directed to:  
Surveyor General and Director,  
Legal Surveys Division,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E9  
Name: W.V. Blackie  
Phone: (613) 995-4341

Information concerning control surveys may be obtained from:  
Geodetic Survey Division,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E9  
Name: F.W. Mosienko  
Phone: (613) 995-4024

When requesting control survey data, the area involved should be defined by latitude and by longitude, and the request should indicate that the data are required for oil and gas exploration related surveys. Air photographs covering all portions of Canada may be obtained from:  
National Air Photo Library,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E9  
Phone: (613) 995-4552  
Attention: G. Nitschky

and  
Publications and Air Photo Section,  
Institute of Sedimentary and Petroleum Geology,  
Department of Energy, Mines and Resources,  
3303 - 33rd Street, N.W.,  
CALGARY, Alberta T2L 2A7  
Phone: (403) 284-0110  
Attention: Mrs. D. Cormier

Topographic maps, indices, charts, atlases and numerous other map publications may be obtained from:

Canada Map Office,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E9  
Phone: (613) 998-9900  
Attention: P.K. Andrews

or  
Publications and Air Photo Section,  
Institute of Sedimentary and Petroleum Geology,  
Geological Survey of Canada,  
3303 - 33rd Street, N.W.,  
CALGARY, Alberta T2L 2A7  
Phone: (403) 284-0110  
Attention: Mrs. D. Cormier

or  
Mining Recorder,  
Department of Indian Affairs and Northern Development,  
Map Office,  
Box 1500,  
YELLOWKNIFE, N.W.T. X1A 2R3

or  
Regional Geologist,  
Department of Indian Affairs and Northern Development,  
200 Range Road,  
WHITEHORSE, Y.T. Y1A 3V1

or  
Information Service and Sales,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
100 West Pender St., 6th Floor,  
VANCOUVER, B.C. V6B 1R3

or  
Maritimes Resource Management Services,  
Information Centre,  
Department of Energy, Mines and Resources,  
Box 310,  
16 Station St.,  
AMHERST, N.S. B4H 3Z5

or  
Ministère de l'Énergie des mines et des ressources  
Bureau régional de vente de cartes  
1535, Chemin Ste-Foy  
QUÉBEC (Québec) G1S 2P1

### ***Geological Survey of Canada***

The Geological Survey of Canada carries out systematic geological and geophysical surveys in the sedimentary basins of Canada, including parts of the regions offshore from the east and west coasts, in Hudson Bay, and in the Arctic Islands.

Enquiries regarding operations and publications of the Geological Survey should be made to,

For operations:

Chief Program Officer,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
601 Booth Street,  
OTTAWA, Ontario K1A 0E8  
Name: J.E. Brindle  
Phone: (613) 995-4182

For publications:

Publications Services,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
601 Booth Street,  
OTTAWA, Ontario K1A 0E8  
Name: J.L.L. Touchette  
Phone: (613) 995-4342

or to:

Director,  
Institute of Sedimentary and Petroleum Geology,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
CALGARY, Alberta T2L 2A7  
Name: D.F. Stott  
Phone: (403) 284-0110

or to:

Director,  
Atlantic Geoscience Centre,  
Department of Energy, Mines and Resources,  
P.O. Box 1006,  
DARTMOUTH, Nova Scotia B2Y 4A2  
Name: M.J. Keen  
Phone: (902) 426-2367

or to:

Director,  
Cordilleran Division,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
100 West Pender Street,  
8th Floor,  
VANCOUVER, B.C. V6B 1R8  
Name: R.B. Cambell  
Phone: (604) 666-1529

or to:

Head, Marine Geology Section,  
Pacific Geoscience Centre,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
Box 6000,  
SIDNEY, B.C. V8L 4B2  
Name: D.L. Tiffin  
Phone: (569) 656-8423

### ***Polar Continental Shelf Project***

The Polar Continental Shelf Project is a continuing investigation of the continental shelf fringing the Arctic coast of Canada, adjacent parts of the Arctic Ocean basin, the islands of the Canadian Arctic Archipelago and the intervening waters, and other areas of special interest.

Enquiries regarding surveys and scientific studies in Arctic areas may be directed to:

Director,  
Polar Continental Shelf Project,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E4  
Name: G. Hobson  
Phone: (613) 996-3388



### ***Earth Physics Branch***

The Earth Physics Branch operates a network of Arctic geophysical observatories and carries out systematic geophysical surveys and studies throughout Canada including the Arctic.

Enquiries regarding the scientific studies, surveys and publications of the Earth Physics Branch should be directed to:

Director General,  
Earth Physics Branch,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0Y3  
Name: K. Whitham  
Phone: (613) 995-5464

### **Department of Fisheries and Oceans *Fisheries Management***

Information may be obtained:

on Yukon freshwater and marine fish from:

Director General,  
Fisheries Management,  
Fisheries and Oceans,  
1909 West Pender Street,  
VANCOUVER, B.C. V6E 2P1  
Name: Dr. E. Johnson  
Phone: (604) 666-6097

on Northwest Territories freshwater fish, including Arctic char from:

Director General,  
Fisheries Management,  
Fisheries and Oceans,  
Freshwater Institute,  
501 University Crescent,  
WINNIPEG, Manitoba R3T 2N6  
Name: Dr. G.H. Lawler  
Phone: (204) 269-7379

on Northwest Territories, including Hudson Bay, marine fish and marine mammals from:

Director,  
Arctic Biological Station,  
Fisheries and Oceans,  
STE. ANNE DE BELLEVUE, Quebec  
H9X 3L6  
Name: Dr. A. Mansfield  
Phone: (514) 457-3660

General information on environment assessment studies and research relating to contaminants in freshwater and marine water of the Arctic from:

Director,  
Aquatic Environment Branch,  
Fisheries and Oceans,  
240 Sparks Street,  
OTTAWA, Ontario K1A 0E6  
Name: Dr. J.C. MacLeod  
Phone: (613) 995-1818

### ***Ocean and Aquatic Sciences***

The Canadian Hydrographic Service publishes charts of Canadian navigable waters.

General information concerning charts may be obtained from:

Canadian Hydrographic Service,  
Department of Fisheries and Oceans,  
615 Booth Street,  
OTTAWA, Ontario K1A 0E6  
Name: Mr. L.P. Murdoch  
Phone: (613) 995-4437

Information concerning charts showing Canada's territorial sea and fishing zone limits and related data may be obtained from:

Canadian Hydrographic Service,  
Department of Fisheries and Oceans,  
615 Booth Street,  
OTTAWA, Ontario K1A 0E6  
Name: Territorial Waters Officer  
Phone: (613) 995-4450

Commercial cable-lay data may be obtained from:

Canadian Hydrographic Service,  
Department of Fisheries and Oceans,  
615 Booth Street,  
OTTAWA, Ontario K1A 0E6  
Name: Mr. J. Bruce  
Phone: (613) 995-4651

Information on tides may be obtained from:  
Tides, Currents and Water Levels,  
Canadian Hydrographic Service,  
Department of Fisheries and Oceans,  
615 Booth Street,  
OTTAWA, Ontario K1A 0E6  
Name: Dr. W.F. Forrester  
Phone: (613) 995-4511

Information on hydrographic surveys and control data  
in the eastern Arctic may be obtained from:  
Regional Hydrographer,  
Canadian Hydrographic Service,  
Atlantic Oceanography Laboratory,  
Department of Fisheries and Oceans,  
Bedford Institute of Oceanography,  
DARTMOUTH, N.S. B2Y 4A2  
Name: Mr. T.B. Smith (Acting)  
Phone: (902) 426-3497

Information on hydrographic surveys and control data  
in the western Arctic may be obtained from:  
Regional Hydrographer,  
Canadian Hydrographic Service,  
Department of Fisheries and Oceans,  
Institute of Ocean Sciences,  
SIDNEY, B.C. V8L 4A8  
Name: Mr. M. Bolton  
Phone: (604) 656-8347

Information related to physical and chemical oceanography may be obtained from:  
Western Arctic (Beaufort Sea and Sverdrup Basin):  
Director General,  
Ocean and Aquatic Sciences,  
Department of Fisheries and Oceans,  
Institute of Ocean Sciences,  
SIDNEY, B.C. V8L 4B2  
Name: Dr. R.W. Stewart  
Phone: (604) 656-8215

Eastern Arctic (Baffin Bay and Davis Strait):  
Director General,  
Ocean and Aquatic Sciences,  
Department of Fisheries and Oceans,  
Bedford Institute of Oceanography,  
DARTMOUTH, N.S. B2Y 4A2  
Name: Dr. C.R. Mann  
Phone: (902) 426-3492

Central Arctic (including Hudson Bay and James Bay):  
Director,  
Ocean and Aquatic Sciences,  
Canada Centre for Inland Waters,  
Department of Fisheries and Oceans,  
P.O. Box 5050,  
BURLINGTON, Ontario L7R 4A6  
Name: D.W. McCulloch  
Phone: (416) 637-4673

Data on physical-chemical oceanography, tidal predictions, wave climate, etc.:  
Director,  
Marine Environmental Data Service,  
Ocean and Aquatic Sciences,  
Department of Fisheries and Oceans,  
240 Sparks Street,  
OTTAWA, Ontario K1A 0E6  
Name: Dr. J.R. Wilson  
Phone: (613) 995-2007

General information on oceanographic activities in the Arctic:  
Director General,  
Marine Sciences and Information Directorate,  
Ocean and Aquatic Sciences,  
Department of Fisheries and Oceans,  
240 Sparks Street,  
OTTAWA, Ontario K1A 0E6  
Name: Dr. N.J. Campbell  
Phone: (613) 995-2039

#### **Department of the Environment *Environmental Protection Service***

This department should be advised by the Regional Director of Resources, Department of Indian Affairs and Northern Development, of any environmental matters such as drilling operations and all seismic activities, including marine seismic surveys, involving the use of high explosives in the event that qualified observers are needed. Information regarding the department's requirement can be obtained from:  
Assistant Deputy Minister,  
Environmental Protection Service,  
Department of the Environment,  
15th Floor, Place Vincent Massey,  
OTTAWA, Ontario K1A 0H3  
Name: Mr. R.M. Robinson  
Phone: (819) 997-1575 or 997-1576

Information concerning spills of oil or hazardous materials including — prevention programs; reporting systems; location of emergency equipment; mapping of sensitive areas; contingency planning and training; and information on research into new cleanup equipment and materials; behaviour and fate of spills; and the detection and tracking of spills — may be obtained from:

Director,  
Environmental Emergency Branch,  
Environmental Protection Service  
Department of the Environment  
15th Floor, Place Vincent Massey,  
OTTAWA, Ontario K1A 1C8  
Name: Dr. J.D. Kingham  
Phone: (819) 997-2037

***Environmental Management Service***

Information concerning wildlife such as the locations of migratory bird sanctuaries and National Wildlife Areas, and the Arctic Ecology Map Series that show important and critical wildlife areas of the Canadian Arctic where human activities can have adverse or destructive impact on wildlife population may be obtained from:

Director General,  
Canadian Wildlife Service,  
Department of the Environment,  
17th Floor, Place Vincent Massey,  
OTTAWA, Ontario K1A 0H3  
Name: Mr. A. Loughrey  
Phone: (819) 997-1301

Information concerning research into stream flow; water levels and quality; permafrost hydrology, flood forecasting; river basin planning; sediment surveys; ice studies; and water demand, supply, use, diversion and conservation; oil spills in icy waters; and environmental impact assessment, may be obtained from:

Director General,  
Inland Waters Directorate,  
Environmental Management Service,  
Department of the Environment,  
6th Floor, Place Vincent Massey,  
OTTAWA, Ontario K1A 0H3  
Name: Mr. N.H. James  
Phone: (819) 997-2055

Information concerning northern forests and vegetation; their mapping; growth; relationship to terrain, soils and landscapes; and stability, may be obtained from:

Director General,  
Canadian Forestry Service,  
Department of the Environment,  
19th Floor, Place Vincent Massey,  
OTTAWA, Ontario K1A 0H3  
Name: Dr. R.J. Bouchier  
Phone: (819) 997-1454

or  
Director,  
Petawawa National Forestry Institute,  
Canadian Forestry Service,  
Department of the Environment,  
CHALK RIVER, Ontario K0J 1J0  
Name: R.M. Newnham  
Phone: (613) 589-2885

or  
Director,  
Northern Forest Research Centre,  
Canadian Forestry Service,  
Department of the Environment,  
5320 – 122 Street,  
EDMONTON, Alberta T6H 3S5  
Name: Dr. G.T. Silver  
Phone: (403) 435-7210

or  
A/Director,  
Pacific Forest Research Centre,  
Canadian Forestry Service,  
Department of the Environment,  
506 West Burnside Road,  
VICTORIA, B.C. V8Z 1M5  
Name: Dr. T.G. Honer  
Phone: (604) 388-3811



The map series *Land Use Information Series* (for northern Canada) provides extensive data on renewable resources and related human activities. Coverage now includes all of the Yukon Territory, the Mackenzie Valley and the Great Slave Lake region. Enquiries for obtaining this map series may be directed to:

Canada Map Office,  
Department of Energy, Mines and Resources,  
OTTAWA, Ontario K1A 0E9  
Phone: (613) 998-9900

Further information on the series may be obtained from:

Lands Directorate,  
Department of the Environment,  
20th Floor, Place Vincent Massey,  
OTTAWA, Ontario K1A 0H3  
Name: Ms. J. Moore  
Phone: (819) 997-2240

#### ***Atmospheric Environment Service***

Requests for information and assistance on meteorological and sea-ice data, climatology, weather forecasting, meteorological instruments and research may be directed to:

Assistant Deputy Minister,  
Atmospheric Environment Service,  
Department of the Environment,  
4905 Dufferin Street,  
DOWNSVIEW, Ontario M3H 5T4  
Name: Dr. A.E. Collin  
Phone: (416) 667-4760

Information may also be obtained through the Meteorological Liaison Officer in Ottawa. This position is filled on a rotational basis.

Enquiries in Ottawa may be directed to:

Liaison Meteorologist,  
Department of the Environment,  
13th Floor, Fontaine Building,  
OTTAWA, Ontario K1A 0H3  
Name: F. Lemire  
Phone: (819) 997-1588

#### **Federal Environmental Assessment Review Office (FEARO)**

FEARO administers the Federal Environmental Assessment and Review Process (EARP). Under EARP all programs, projects and activities initiated or sponsored by federal departments and agencies, or involving federal lands or funds, must be screened for environmental effects. Activities with potentially significant adverse environmental effects must be referred by the initiating federal agency to FEARO for a formal review by an Environmental Assessment Panel. Further information may be obtained from:

Executive Chairman,  
Federal Environment Assessment Review Office,  
13th Floor, Fontaine Building,  
OTTAWA, Ontario K1A 0H3  
Name: Mr. F.G. Hurtubise  
Phone: (819) 997-3426 or 997-1000

#### **Department of National Defence Operations**

The Regional Director of Resources will inform the Department of National Defence of any exploration program proposed for the offshore.

Operations in all areas are of interest to:

National Defence Headquarters,  
OTTAWA, Ontario K1A 0K2  
Attention: NDOC

Operations in Baffin Bay and Arctic waters east of longitude 105°W are handled by the office of:

Commander, Maritime Command,  
Department of National Defence,  
F.M.O.  
HALIFAX, N.S. B3K 2X0

Operations in Arctic waters west of longitude 105°W are handled by the office of:  
Commander, Maritime Forces Pacific,  
Department of National Defence,  
F.M.O.  
VICTORIA, B.C. V0S 1B0

Operations onshore north of 60° are handled by the office of:  
Commander, Northern Region,  
Evans Block,  
P.O. Box 6666,  
YELLOWKNIFE, N.W.T. X1A 2R3

#### ***Search and Rescue***

The Department of National Defence is responsible for the co-ordination of search and rescue (SAR) operations in Canada.

The Canadian area of responsibility is divided into four SAR areas as listed below:

#### ***Edmonton SAR***

This area includes the three Prairie Provinces, all of the Northwest Territories mainland and Arctic Islands, the western half of Hudson Bay, and Baffin Island north of 70°N.

The contact is:  
Edmonton Search and Rescue Region  
Phone: (403) 973-8402

#### ***Victoria SAR***

This area includes British Columbia, Canadian waters off the west coast, the Yukon Territory and the Beaufort Sea south of 70°N and west of 135°W.

The contact is:  
Victoria Search and Rescue Region  
Phone: (604) 388-1543

#### ***Halifax SAR***

This area includes Quebec east of 70°W, the Maritime Provinces, Labrador, Canadian waters off the East Coast, Foxe Basin, Hudson Strait and Baffin Island south of 70°N.

The contact is:  
Halifax Search and Rescue Region  
Phone: (902) 426-4730 or 426-4735

#### ***Trenton SAR***

This area includes all Ontario, Quebec west of 70°W, eastern Hudson Bay and James Bay.

The contact is:  
Trenton Search and Rescue Region,  
Phone: (613) 392-2811 Locals 3870, 3875

Any of the following may also be contacted in case of emergencies: air traffic control centres, airport control towers, radio stations, marine radio stations, RCMP detachments, provincial and municipal police stations.

The following information is required when reporting an emergency:

- a. Name of caller, phone number, and official connection, e.g., RCMP detachment commander, aircraft owner, etc.;
- b. Assistance required;
- c. Description of aircraft, boat, or whatever craft is involved;
- d. Full details as to the nature of distress or emergency.

#### ***Department of Transport Aids and Waterways Branch***

This branch includes three divisions which might have a particular interest in offshore exploration programs:

The Vessel Traffic Management and Information Systems Division requires at least 60 days notice before the commencement of any offshore exploration program, in order that they may issue the appropriate notices to mariners. These notices receive world-wide distribution on a weekly basis.

The Marine Aids Division is responsible for identifying any aids to navigation that may be necessary for the program.

The Navigable Waters Protection Act Programs Division requires advance notice of 90 days in any case where drilling involves the territorial sea, in order for approval to be granted under the Navigable Waters Protection Act.

All communications on these matters should be directed to:

Director,  
Aids and Waterways Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario K1A 0N7  
Name: J.N. Ballinger  
Phone: (613) 992-2736

In addition, there are a number of departmental officers who may be contacted in the field should the need arise. Regional Offices of the Canadian Coast Guard are located in St. John's Nfld., Dartmouth, N.S., Quebec, Que., Toronto, Ont., and Vancouver, B.C. With respect to aids to navigation in the Arctic, the officers listed below may be contacted:

(i) District Manager,  
Canadian Coast Guard,  
Transport Canada,  
101 Champlain Boulevard,  
QUEBEC, Quebec G1K 4H9  
Phone: (418) 694-3420

(ii) District Manager,  
Canadian Coast Guard,  
Transport Canada,  
P.O. Box 5002,  
HAY RIVER, N.W.T. 0XE 0R0  
Phone: (403) 874-2406

(This office handles aids to navigation in the Hudson Bay and Strait areas.)

#### **Fleet Systems Branch**

This Branch has major responsibilities in two areas of concern in offshore operations: support of shipping in ice-congested waters, and marine search and rescue.

If operations are being contemplated in areas where ice may be a problem and where ice-breakers or other support may be desired, there should be consultation with the Director, Fleet Systems.

Further information and assistance may be obtained from:

Director,  
Fleet Systems Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario K1A 0N7  
Name: J.Y. Clarke  
Phone: (613) 992-4209

#### **Search and Rescue (Marine)**

The Canadian Coast Guard (CCG) of the Department of Transport, Marine Administration is responsible for providing marine search and rescue vessels and the Canadian Coast Guard Marine Controllers who work with Defence personnel in co-ordinating the marine input to search and rescue operations for the Rescue Co-ordination Centres (RCC'S) in Victoria, Trenton and Halifax. CCG personnel completely man the Search and Rescue Emergency centres in St. John's and Quebec. There are no CCG personnel in the RCC Edmonton. The Canadian Coast Guard is responsible for marine accident prevention through boating safety education and regulations and for organizing and managing of the Canadian Marine Rescue Auxiliary. The Commissioner of the Canadian Coast Guard is co-chairman of the Interdepartmental Committee on Search and Rescue (ICSAR), which is responsible for co-ordinating the search and rescue efforts of the Departments of National Defence and Transport.

Director, Fleet Systems Branch (as above).

or  
Chief, Search and Rescue,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario K1A 0N7  
Name: A.F. Mountain  
Phone: (613) 995-5861



### **Ship Safety Branch**

This Branch includes the Steamship Inspection Division, the Registry of Shipping, and the Nautical Division. The responsibilities of the Steamship Inspection Division include inspection and certification of ships under the Canada Shipping Act and the Arctic Waters Pollution Prevention Act. This Division also deals with ship safety and pollution matters arising from ship operations, and the application of the Arctic Shipping Pollution Prevention Regulations.

The Nautical Division deals with marine personnel, operational and navigation safety matters. At least 60 days notice is required by this Division when drilling operations are planned for areas lying in or near charted ship routes so that any necessary authority may be issued.

Further information and assistance may be obtained from:

Director,  
Ship Safety Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario K1A 0N7  
Name: D.L. Findlay  
Phone: (613) 992-8892

### **Canadian Coast Guard Emergencies**

This office is responsible for the marine contingency planning function of the Department of Transport and also supplies co-ordination and assistance when a federal response is made to combat a spill of oil or toxic materials into the marine environment. The response is made under the Coast Guard's Arctic Marine Emergency Plan or in the case of international boundary waters, the appropriate Joint International Plan.

Further information and assistance may be obtained from:

Coast Guard Emergencies,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario K1A 0N7  
Name: Capt. M.S. Greenham  
Phone: (613) 992-9743 or 992-9210

### **Coast Guard Casualty Investigations**

This office is responsible for marine accident investigations, enquiries, and wrecks.

Further information and assistance may be obtained from:

Chief,  
Coast Guard Casualty Investigations,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario K1A 0N7  
Name: Capt. W.A.W. Catinus  
Phone: (613) 992-4930 or 996-3808

### **Telecommunications & Electronics Branch**

The major responsibilities of this Branch include the provision of maritime mobile communications and the operation and maintenance of electronic aids to navigation. The publication *Radio Aids to Marine Navigation* provides details of all services provided.

The maritime mobile communications function includes a *Safety Service* of weather, ice and navigation broadcasts and the monitoring of designated frequencies for distress, urgency and safety purposes. It also includes a *Public Correspondence Service* for the transmission and reception of ship-shore radio-telegrams and, where practicable, for ship-shore marine telephone calls.

Further information and assistance may be obtained from:

Director,  
Telecommunications & Electronics  
Branch,  
Canadian Coast Guard,  
Transport Canada,  
OTTAWA, Ontario K1A 0N7  
Name: B.B. Borodchak  
Phone: (613) 996-3621

**Department of Communications**  
***Telecommunication Regulatory Service***

The responsibilities of this agency include the development of technical standards, the selection and coordination of radio frequencies, and the licensing of all classes of radio station except broadcasting stations.

An operator planning to use radio-communications in his offshore activities should make application for licensing of any radio station in Canada or on board any Canadian vessel involved at least six weeks before the proposed in-service date of the communication facility. Details as to the licensing requirements and the necessary application forms may be obtained from the following addresses:

In Ottawa:  
Director,  
Operations Branch,  
Telecommunication Regulatory Service,  
Department of Communications,  
300 Slater Street,  
OTTAWA, Ontario K1A 0C8  
Phone: (613) 992-9642

Companies in western Canada may contact:  
Regional Director,  
Pacific Region,  
Department of Communications,  
325 Granville Street, Room 300,  
VANCOUVER, B.C. V6C 1S5  
Phone: (604) 666-1469

Regional Director,  
Central Region,  
Department of Communications,  
2300 - One Lombard Place,  
WINNIPEG, Manitoba R3B 2Z8  
Phone: (204) 949-4395

District Manager,  
Department of Communications,  
205 - 8th Avenue, S.E., Room 803-805,  
CALGARY, Alberta T2G 0K9  
Phone: (403) 231-4203

District Manager,  
Department of Communications,  
400 Baker Center,  
10025 - 106th Street,  
EDMONTON, Alberta T5J 1G6  
Phone: (403) 425-5614

District Manager,  
Department of Communications,  
202 - 11117 - 100 Street,  
GRANDE PRAIRIE, Alberta T8V 2N2  
Phone: (403) 532-3533

Companies in northern Canada may contact:  
District Manager,  
Department of Communications,  
P.O. Box 540,  
FORT SMITH, N.W.T. X0E 0P0  
Phone: (403) 872-2187

District Manager,  
Department of Communications,  
Polaris Building,  
201 - 4133 - 4th Avenue,  
WHITEHORSE, Y.T. Y1A 1H8  
Phone: (403) 667-5102

District Manager,  
Department of Communications,  
P.O. Box 2700,  
YELLOWKNIFE, N.W.T. X0E 1H0  
Phone: (403) 873-3568

Companies in central Canada (Ontario/Quebec) may contact:  
Regional Director,  
Ontario Region,  
Department of Communications,  
9th Floor, 55 St. Clair Avenue East,  
TORONTO, Ontario M4T 1M2  
Phone: (416) 996-6289

Regional Director,  
Quebec Region,  
Department of Communications,  
19th Floor, 2085 Union Street,  
MONTREAL, Quebec H3A 2C3  
Phone: (514) 283-5682

Companies in eastern Canada may contact:  
Regional Director,  
Department of Communications,  
7th Floor, Terminal Plaza Building,  
1222 Main Street,  
MONCTON, N.B. E1C 8P9  
Phone: (506) 858-2025

**National Research Council of Canada (NRCC)**  
***Space Research Facilities Branch***

Operators planning offshore activities in the Hudson Bay region must inform this agency of the National Research Council well in advance since scientific sounding rockets are launched from time to time from the NRCC Churchill Research Range. Information is requested well in advance to permit the co-ordination of activities:

Head of Operations,  
Space Research Facilities Branch,  
National Research Council of Canada,  
OTTAWA, Ontario K1A 0R6  
Name: J.A. Tarzwell  
Phone: (613) 993-9385  
Telex: 053-3145

Rockets are also launched from time to time from rocket launch facilities at Cape Parry, N.W.T. Operators planning exploration work in the Arctic Islands are urged to co-ordinate their activities with the National Research Council of Canada.

**Department of National Revenue**  
***Customs and Excise***

The Headquarters Operations Directorate administers that portion of the Canada Shipping Act that relates to the coastal trade. In this connection, any company importing ships or specialized plants and equipment for exploration work on Canada's seacoasts and among the Arctic Islands may obtain information, assistance and such other contacts as may be necessary in Customs and Excise from:

Director General,  
International Traffic Programs Division,  
Revenue Canada,  
Customs and Excise,  
OTTAWA, Ontario K1A 0L5  
Name: E.D. Warren  
Phone: 613-992-0693

**Canada Employment and Immigration Commission**  
***Canada Immigration Division***

Director,  
Policy Liaison,  
Recruitment and Selection Branch,  
Canada Employment and Immigration Commission,  
OTTAWA, Ontario K1A 0J9  
Name: C.W. Lloyd  
Phone: 613-994-1483

The Winnipeg and Edmonton offices of the Canada Employment and Immigration Commission can answer any queries regarding entry into the Northwest Territories. The Vancouver office can respond to queries for entry into the Yukon Territory.

At Tuktoyaktuk, a local RCMP officer is also a representative for Employment and Immigration and can clear entry into Canada via Tuktoyaktuk.

At Inuvik, the Manager, Canada Employment Centre, can be contacted by telephone if prior arrangements are necessary. There is no representative in Aklavik: in the event that a seismic crew prefers to land at Aklavik, arrangements must be made with the Inuvik representative.



# Appendix II

## Directives

The following directives have been sent to all permittees and lessees.

### ***Expenditures Relating to Processing and Interpretation of Geophysical Data Acquired on Canada Lands***

"An information letter was distributed to all Permittees and Lessees advising operators that as from January 1, 1974, expenditures incurred in computer processing and the interpretation of Geophysical Data acquired in the course of exploration activities involving Canada Lands will not be considered eligible for approval as allowable expenditures unless such processing and interpretation has been carried out in Canada.

After January 1, 1974, an operator submitting a claim pursuant to the Canada Oil and Gas Land Regulations, for allowable expenditures involving geophysical operations undertaken on Canada Lands must identify on his statement of expenditures the name of the company or companies involved together with the location of: (a) the computer facilities utilized in the processing of the geophysical data; and (b) the offices wherein interpretation of the geophysical data was undertaken. Expenditures incurred for computer processing must be separately identified and not included as part of the costs incurred for interpretation.

Further in this regard, the processing of geophysical data undertaken on board non-Canadian seismic ships will be considered to be work undertaken outside Canada and not eligible for approval as allowable expenditures.

Signed  
Director,  
Northern Non-Renewable Resources Branch,  
Department of Indian Affairs and Northern Development."

### ***Transfer of Interest - Canada Lands***

"The Canada Oil and Gas Land Regulations stipulate that no transfer of an oil and gas permit or lease shall pass any interest in a permit or lease until the transfer is registered in accordance with the Regulations, which registration must be approved by the Chief. Please be advised that one of the considerations for the approval of the registration of a transfer of any interest in a permit or lease will be that all agreements or an executive summary relating to such transfer of interest have been deposited with the Chief.

All permittees are requested, therefore, to arrange to forward a copy of each current agreement, or an executive summary, to the federal agency concerned at their earliest convenience. In future such agreements should be deposited with the Chief of the appropriate federal agency at the time they are made.

The confidentiality of documents relating to these agreements will of course be maintained until permission to release them is given by the Companies involved.

Signed  
Director,  
Northern Non-Renewable Resources Branch."

### ***Importation and Operation of Foreign Vessels***

"The importation and operation of vessels coastwise or between Canadian and foreign ports are subject to the Customs Act, the Canada Shipping Act, and Coastwise and Foreign Shipping Regulations and the Customs Tariff. These acts and regulations, *Inter Alia*, are administered by the Customs Programs Branch of the Department of National Revenue.

A company wishing to import ships or specialized plant and equipment for exploration work off Canada's seacoasts is requested to make application well in advance of the proposed commencement date of any programme. In order to ensure that the application is processed properly, this department should be advised at least ninety days before the commencement of the programme. This lead time of ninety days is needed to determine the suitability of Canadian-flag vessels declared available to fulfill the purposes respecting which temporary entry is sought.

Each application must state the area of operation and the approximate time span, and contain a description of the salient features of the energy source equipment proposed for the particular operation. Information should also be supplied in respect of all other essential criteria required, including bunker and stores capacity, accommodation, clear deck space, size of instrumentation room, electrical energy additional to vessel's normal operation needs and possible draft restrictions.

Any additional information, assistance and other contacts as may be necessary in Customs and Excise may be obtained from:

Director,  
International Traffic Programs Directorate,  
Department of National Revenue,  
Customs and Excise,  
OTTAWA, Ontario K1A 0L5  
Phone: (613) 992-0693"

### **Metric Conversion**

**"To:** All Permittees and Lessees  
All Oil and Gas Operators  
Canadian Petroleum Association  
Independent Petroleum Association of Canada  
Canadian Association of Oil Well Drilling  
Contractors

The Metric Conversion Plan Sector 4.02, as approved by the Metric Conversion Committee and the Petroleum and Natural Gas Industry, became operational in SI on 79-01-01.

The Departments of INA and EMR wish to advise that drilling authorities and other reporting forms were issued in SI units as of 79-01-01, and that after that date departmental data are compiled only in these units. Please consult the 3rd Edition of the Supplementary Metric Practice Guide for the correct usage of terms and abbreviations. This publication is available from the Canadian Petroleum Association in Calgary.

The following table indicates the appropriate units and sensitivities that the Departments will require for the various drilling and production data.

<i>Item</i>	<i>Reporting SI Unit</i>	<i>Required Sensitivities</i>
Hole size	mm	10 mm (tens of units)
Pressure	kPa	10 kPa (tens of units)
Casing diameters	mm	1 mm (units)
Density	kg/m <sup>3</sup>	1 kg/m <sup>3</sup> (units)
Lease and Permit areas	ha	1 ha (units)
Volume of water, oil and other liquids (15°C)	m <sup>3</sup>	0.1 m <sup>3</sup> (tenths)
Gas volumes (15°C and 101.325 kPa)	10 <sup>3</sup> m <sup>3</sup>	0.1 10 <sup>3</sup> m <sup>3</sup> (tenths)
Depths & short distances	m	0.1 m (tenths)
Distances	km	0.1 km (tenths)
Oil royalty calculations	m <sup>3</sup>	0.01 m <sup>3</sup> (hundredths)
Amount of cement	t	0.01 t (hundredths)

Any questions regarding these matters may be referred to Mr. S.A. Kanik, Northern Program Metric Co-ordinator at 819-997-9444, and to Mr. F. Lepine, RMB Metric Co-ordinator at 613-995-9351."

# Appendix III

## Reporting Forms

The Northern Non-Renewable Resources Branch, DINA, is a member of the *Federal-Provincial Committee on Energy Statistics* and the *Mines Ministers Subcommittee on Oil and Gas Statistics* and together with the four western provinces and Statistics Canada has standardized all its oil and gas reporting forms. This standardization has removed duplication among government agencies and more importantly, industry can now complete all oil and gas reporting forms from the western provinces and the Yukon and Northwest Territories on electronic data processing equipment without change to programs.

<i>Form No.</i>	<i>Title of Form</i>
IAND 52-90-1 *	Application for a Drilling Authority
IAND 52-90-2	Well Completion Data
IAND 52-90-3 *	Application to Amend a Drilling Authority
IAND 52-90-4 *	Application to Change a Well Name
IAND 52-90-5 *	Application to Abandon a Well or Suspend Drilling
IAND 52-90-6 *	Application to Alter Condition of a Well
IAND 52-90-7	Work-over Report No.
IAND 52-90-8	Application to Commingle Production before Measurement
IAND 52-90-9	Data for Back Pressure Test on Natural Gas Wells-Monograph 7 Method
IAND 52-90-10	Data for Back Pressure Test on Natural Gas Wells-Vitter's Method
IAND 52-90-11	M.P.R. - Oil Calculations
IAND 52-90-12	New Oil Well Report
IAND 52-90-13	New Gas Well Report
IAND 52-90-17	New Service Well Report
IAND 52-90-18	Monthly Water Flood Operations Report
IAND 52-90-20	Monthly Water Receipts and Disposal of Fluids Report
IAND 52-90-23	Geologic Surface Survey & Air-photo Analysis - Expenditures
IAND 52-90-24	Land Geophysical Operations - Expenditures
IAND 52-90-25	Marine Geophysical Programs - Expenditures
IAND 52-90-26	Drilling & Structure Test Drilling Expenditures

IAND 52-90-27	Participation Programs - Expenditures
IAND 52-90-28	Geophysical - Seismic, Aeromagnetometer, Gravity Survey - Participation Program Operators
IAND 52-90-29	Research Program, Environmental Studies - Participation Program Operators
IAND 52-90-30	Geological Surveys, Photogeological, Mapping and Analyses - Participation Program Operators
IAND 52-91 *	Notice of Commencement of Exploratory Work
IAND 52-91-1 *	Notice of Commencement of Research and Development Work
IAND 52-92	Application for Authority to Drill Structure Test Hole
IAND 52-93	Report on Abandonment of Structure Test Hole
IAND 52-83	Grouping Notice
IAND 52-103 *	Application for Oil and Gas Lease
IAND 51-183	Monthly Accident Summary

All forms to be completed by operator.

\*To be completed in triplicate; all other forms to be completed in duplicate.

All forms, except IAND 52-83, IAND 52-90-23 to IAND 52-90-27, IAND 52-91, IAND 52-91-1, and 51-103, are submitted to the Regional Oil and Gas Conservation Engineer, Yellowknife, N.W.T.

Forms IAND 52-83, 52-90-23 to 52-90-27 and 52-103 are submitted to the Northern Non-Renewable Resources Branch, Ottawa, Ontario K1A 0H4.



Forms IAND 52-91 and 52-91-1 should be submitted to the Oil and Gas Exploratory Operations Section – P.O. Box 2638, Postal Station ‘M’, Calgary, Alberta T2P 3C1.

The following forms have been issued pursuant to the Canada Oil and Gas Land Regulations and Canada Oil and Gas Drilling Regulations. These forms are to be completed when applicable during the production stage of oil and gas wells, and refinery operations.

<i>Form No.</i>	<i>Title of Form</i>
IAND 52-116-1	Monthly Production Report
IAND 52-116-2	Monthly Disposition and Crown Royalty Statement
IAND 52-116-3	Monthly Gas Gathering Statement
DBS 6511-38	Monthly Oil Pipeline Gathering Operations Statement
IAND 52-116-5	Monthly Crude Oil and Condensate Purchaser's Statement
IAND 52-116-6	Monthly Gas Plant Statement
DBS 6511-37	Monthly Natural Gas Distributors Statement
IAND 52-116-8	Monthly Gas Processing Plant Products Statement
IAND 52-116-9	Monthly Liquefied Petroleum Gas Purchaser's Statement
IAND 52-116-10	Monthly Refinery Operations Report
IAND 52-116-11	Monthly Gas Injection Operations Report
IAND 52-116-12	Statement of Nomination and Estimated Requirement of Crude Oil, Condensate and Pentanes Plus
IAND 52-116-13	Monthly Sulphur Plant Operations Report

**Notes:**

- (a) All forms to be completed by Operator.
- (b) Forms 6511-37 and 6511-38 are completed by the Operator in triplicate. The first two copies are to be forwarded to the Northern Non-Renewable Resources Branch in Ottawa, and the third to the Regional Oil and Gas Conservation Engineer, Yellowknife, N.W.T.

The other forms listed above are completed in duplicate. The original is submitted to the Northern Non-Renewable Resources Branch in Ottawa and one copy to the appropriate Regional Oil and Gas Conservation Engineer, Yellowknife, N.W.T.

All the above forms have been converted to SI units and distributed to industry. The use of SI units became mandatory as of January 1, 1979.

# Appendix IV

## Summaries of the Geological Provinces

### 1 Arctic Stable Platform

The Arctic Stable Platform lies between the Precambrian Shield to the south and the Franklinian geosyncline to the north and west. The area is underlain by thin, gently dipping, relatively undisturbed Lower Paleozoic carbonates that overlie the craton and thicken northward from the Shield. The Platform is divided into several individual basins, Foxe Basin being the one farthest to the east.

### 2 Franklinian Geosyncline (Arctic Fold Belt)

The limits of Paleozoic deformation define the division between the Franklinian Geosyncline and the Arctic Stable Platform to the south and east. The area was the site of continuous sedimentation from Cambrian to Upper Devonian time. Two depositional belts are recognized; a miogeosynclinal belt extending from Banks Island to northern Greenland, and a eugeosynclinal belt exposed only on Axel Heiberg and Ellesmere Islands. Thick carbonates and clastics constitute potential reservoirs. Strata were folded in the Ellesmerian orogeny of Late Devonian or Early Carboniferous time and these folded strata also constitute the "basement" underlying the Sverdrup Basin.

### 3 Sverdrup Basin

A major angular unconformity marks the base of the Sverdrup Basin, a successor basin with a stratigraphic sequence of Lower Pennsylvanian to Tertiary strata overlying the folded Paleozoic rocks of the Franklinian Geosyncline. The structural and depositional axis of the Sverdrup Basin strikes northeast from Banks Island to northern Ellesmere Island. The thickness of sediments in the basin is in excess of 7 600 m along this axis. The sediments, which are interrupted by a number of unconformities, thin from the axis to form an elongated basin. Sediment thickness and facies indicate that the present south and east limits of the basin are close to the original depositional limits. Tertiary strata of the Arctic Coastal Plain overlap the northern and western margins. Evaporites of late Paleozoic age form piercement structures in the axial zone. Upper Cretaceous and older sediments are intruded by igneous sills and dykes of varying thickness, mostly in the eastern half of the basin. The Eureka orogeny, in late Creta-

ceous and early Tertiary time, produced folding and faulting throughout the basin; deformation was accompanied by emplacement or reactivation of piercement bodies. Intensity of deformation increases towards the northeast margin of the basin. Thick, sandy sequences of Jurassic and Triassic age contain the major hydrocarbon reserves.

### 4 Arctic Coastal Plain

The north and west margins of the Sverdrup Basin, both on land and offshore, are covered by thick relatively undisturbed Tertiary and Pleistocene clastics. Beds dip gently toward, and thicken on, the continental shelf and slope. In this area the continental shelf is approximately 160 km wide. The waters covering the shelf offshore from the Mackenzie Delta are called the Beaufort Sea. The continental slope, here, is between 600 and 3 000 m water depth. The deep Arctic Ocean, termed the Canada Basin, forms an abyssal plain seaward of the slope. The Tertiary and Mesozoic are considered to have the best potential, offshore, for oil and gas. Permanent ice cover and a short drilling season have hindered or made costly the drilling in the offshore regions.

### 5 Baffin Bay – Davis Strait Basin

The Baffin Bay – Davis Strait Basin lies entirely offshore. Several theories to explain the origin of the basin have been advanced: a widely accepted one involves continental drift by which Greenland and the Baffin land mass spread apart about a pivotal point located somewhere to the northwest. Geophysical surveys have demonstrated that the basin is underlain by an oceanic crust, that there is no mid-basin ridge, and that as much as 7 600 m of sediment cover the floor. Sediments thin to zero in nearshore areas and over the Davis Strait Sill. Rocks cropping out around the basin margins are predominantly Precambrian. Major centres of deposition are the Thule Basin off Greenland, the Lancaster Delta, the Home Bay Delta and the Cumberland Delta. Lancaster Sound and Jones Sound are structurally controlled grabens in which thick deltaic clastics accumulated. A major Tertiary drainage system transported sediment to the basin from a source area to the west. The large volume of geologically young sediments and the presence of favourable trapping conditions for hydrocarbons give the Baffin Bay – Davis Strait area a high hydrocarbon potential.

## **6 Banks Basin**

The Banks Basin occupies the central and west-central part of Banks Island and the adjacent coastal plains. Tertiary and Cretaceous clastics overlie mainly Lower and Middle Devonian sediments over much of the area. Proterozoic rocks of the Minto Arch occur at the southernmost tip. The sediments of the Banks Basin have been sparsely drilled and the presence of thick Tertiary and Mesozoic sediments and the reefal facies of the Devonian-Silurian carbonates give the area a moderate potential for hydrocarbon accumulations.

## **7 Mackenzie – Beaufort Basin**

The Mackenzie Delta – Beaufort Sea petroleum province is made up of a thick section containing productive Cretaceous and Tertiary sands. The Mackenzie Delta, the southern portion of the Mackenzie – Beaufort Basin, is bounded by the Romanzof uplift to the southwest, the Richardson Mountains to the south, the Eskimo Lakes Arch to the southeast and the Arctic Ocean to the north. The Beaufort Sea is one of several marginal embayments that occur as indentations in the coastline of the Arctic Ocean. The coastal plain, which lies adjacent to the Beaufort Sea, is laterally continuous with the continental shelf and is considered as the onshore, exposed extensions of the Beaufort Sea shelf. The Beaufort Sea petroleum province is contiguous with the Yukon and Mackenzie coastal plains and the Banks coastal plain.

Growth faults extend seaward from the Mackenzie Delta across the coastal plain. Shale diapirs form large, mostly offshore structures. Potential reservoir rocks, which include deltaic and marine sandstones are interbedded and continuous with organic-rich shales.

## **8 Interior Plains**

a) Great Slave Plain – The Great Slave Plain encompasses an area extending westward from Great Slave Lake to the Liard Plateau and Mackenzie Mountains. Underlying strata are mainly of Devonian age, covered in part by remnants of a thick Cretaceous sequence. The total thickness of sediment ranges from zero in the east to more than 3 000 m in the west. Gas reservoirs are found in porous dolomites and limestones of Middle Devonian age.

b) Great Bear Plain – The Great Bear Plain consists of Lower and Upper Cretaceous sediments partially on a bedrock of Ordovician to Devonian age. The total thickness of the sediments wedges from zero in the east to more than 1 800 m in the west along the eastern edge of the Franklin Mountains.

c) Anderson Plain – The Anderson Plain lies east of the Mackenzie Delta. Cretaceous beds cover much of the Plain and lie unconformably on Lower and Middle Paleozoic beds. Sediments more than 2 400 m thick occur in a southwest-northeast trend through the wells C.P.O.G. Kugaluk N-02 and Elf Horton River G-02. Hydrocarbon shows have been encountered in the Cretaceous deposits.

d) Mackenzie Plain – The Mackenzie Plain lies between the Franklin and Mackenzie Mountains. Cretaceous beds lie unconformably on Lower and Middle Paleozoic beds. Sediments range in thickness from 1 200 m to 2 700 m. Oil is produced in the Mackenzie Plain at Norman Wells, from the Devonian Kee Scarp formation. Additional hydrocarbon shows have been encountered in the Cretaceous and Silurian.

e) Peel Plain – The Peel Plain lies northeast of the Peel Plateau and northwest of the Mackenzie Plain. It is covered by Cretaceous and Jurassic sediments which overlie Paleozoic carbonates and shales. The sediments are similar to those of the Mackenzie Plain and range in thickness from more than 4 200 m in the southwest to 2 400 m in the northeast. Hydrocarbon shows have been encountered in the Lower Devonian.



## **9 Liard Plateau and Range**

The Liard Plateau and Range lie west of the southern portion of the Great Slave Plain and northwest of the Fort Nelson Lowland. A thin Cretaceous cover lies unconformably on Paleozoic beds. The Beaver River and Pointed Mountain fields produce or have produced gas from thrust dolomites of the Nahanni formation of Middle Devonian Age. Production in the now depleted Beaver River field in the Yukon was also from large faulted anticlines containing Mississippian sands.

## **10 Eagle Plain**

The Eagle Plain basin is contained between the Ogilvie and Richardson Mountains. Sediments approach 6 100 m in thickness, of which about 3 000 m are late Paleozoic to Mesozoic in age, the remainder being Cenozoic. The basin has been tectonically deformed. Hydrocarbon shows have been encountered in Mississippian, Devonian and Ordovician beds.

## **11 Peel Plateau**

The Peel Plateau is bounded on the northeast and the east by the Peel Plateau Plain, on the south by the Mackenzie Mountains, and on the west by the Richardson Mountains. The Plateau is covered by Tertiary and Cretaceous clastics unconformably overlying Paleozoic shales and carbonates. The sediments range in thickness from 3 000 m in the east to 6 100 m in the west. Shows of hydrocarbons have been encountered in Cretaceous and Middle Devonian strata.

## **12 Old Crow Basin**

The Old Crow Basin is a relatively unexplored intermontane basin covering an area of about 6 200 km<sup>2</sup> centered at about latitude 68°N and longitude 140°W. Geophysical data indicate a thickness of from 500 to 1 500 m of Mesozoic and Tertiary clastics overlying as much as 3 000 m of Upper Devonian to Permo-Carboniferous sediments. The Old Crow Basin as it now exists was formed by the Laramide orogeny in Tertiary time.

## **13 Whitehorse Basin**

The Whitehorse Basin lies at the northern end of the Central Cordilleran Geosyncline. It is about 240 km long and 110 km wide and contains up to 4 600 m of sediments ranging in age from early Cretaceous to Late Triassic.

A selected bibliography of the geology of the Yukon and Northwest Territories is provided in Appendix V.

# Appendix V

## Selected Bibliography

A wide variety of reports and papers applicable to geological provinces or basins in northern Canada are available; a majority are Geological Survey of Canada (GSC) publications or are in proceedings and memoirs of various societies. A listing of all GSC reports may be found in *Index to Publications 1959 – 1974* by P.J. Griffen, published by the GSC in 1976. The following is a list of the more important of these papers.

Aitken, J.D., and Glass D.J. (Editors)  
1973: GAC – CSPG Proceedings of the Symposium on the Geology of the Canadian Arctic.

McCrossan, R.G. (Editor)  
1973: Future Petroleum Provinces of Canada; CSPG Memoir 1, Canadian Society of Petroleum Geologists.

Wren, A.E. and Cruz R.B. (Editors)  
1974: Proceedings of the 1973 National Convention; Canadian Society of Exploration Geophysicists.

Yorath, C.J., Parker, E.R. and Glass, D.J. (Editors)  
1975: Canada's Continental Margins and Offshore Petroleum Exploration; CSPG Memoir 4, Canadian Society of Petroleum Geologists.

For a complete list of oil industry technical reports released from confidential status, the reader should refer to the DINA publication *Technical Reports Available for Inspection – 1921-1980*.

Important references not found in the preceding publications are listed below.

### **Northwest Territories – Mainland**

Bily, C. and Dick, J.W.C.  
1974: Naturally Occurring Gas Hydrates in the Mackenzie Delta, N.W.T.; Bull. Can. Pet. Geol., Vol. 22, No. 3, pp. 340-353.

Cote, R.P., Rector, R., Lerand, M.  
1974: Gulf Describes Geology of the Parsons Lake Gas Find; Bull. Can. Pet. Geol. – Vol. 22, No. 1, pp. 72-78.

Crickmay, C.H.  
1970: Ramparts, Beavertail and Other Devonian Formations; Bull. Can. Pet. Geol., Vol. 18, No. 1, pp. 67-79.

Law, J.  
1971: Regional Devonian Geology and Oil and Gas Possibilities, Upper Mackenzie River Area; Bull. Can. Pet. Geol., Vol. 19, No. 2, pp. 437-484.

Meijer-Drees, N.C.  
1975: Geology of the Lower Paleozoic Formations in the Subsurface of the Fort Simpson Area, District of Mackenzie; GSC Paper 74-40.

Smith, M.W.  
1976: Permafrost in the Mackenzie Delta; GSC Paper 75-28.

Vopni, L.K., and Lerbekmo, J.F.  
1972: The Horn Plateau Formation: A Middle Devonian Coral Reef Northwest Territories; Bull. Can. Pet. Geol., Vol. 20, No. 3, pp. 498-548.

Young, F.G.  
1975: Upper Cretaceous Stratigraphy, Yukon Coastal Plain and Northwestern Mackenzie Delta; GSC Bull. 249.

Young, F.G., Myhr, D.W., and Yorath, C.J.  
1976: Geology of the Beaufort – Mackenzie Basin; GSC Paper 76-11.

### ***Eagle Plain and Northern Yukon***

Bamber, E.W. and Waterhouse, J.B.

1971: Carboniferous and Permian Stratigraphy and Paleontology, Northern Yukon Territory; Bull. Can. Pet. Geol., Vol. 19, No. 1, pp. 29-249.

Lenz, A.C.

1972: Ordovician to Devonian History of Northern Yukon and Adjacent District of Mackenzie; Bull. Can. Pet. Geol., Vol. 20, No. 2, pp. 321-361.

Miall, A.D.

1973: Regional Geology of Northern Yukon; Bull. Can. Pet. Geol., Vol. 21, No. 1, pp. 81-116.

Norris, A.W.

1967: Devonian and Northern Yukon Territory and Adjacent District of Mackenzie; Int. Symp. on Devonian System, Alberta Soc. Pet. Geol.

### ***Arctic Islands***

Balkwill, H.R.

1978: Evolution of Sverdrup Basin, Arctic Canada; Bull. Am. Assoc. Pet. Geol., Vol. 62, No. 6, pp. 1004-1028.

Embry, A.F., and Klovan, J.E.

1976: The Middle - Upper Devonian clastic wedge of the Franklinian Geosyncline; Bull. Can. Pet. Geol., Vol. 24, No. 4 pp. 485-639.

Frebold, H.

1975: Jurassic Faunas of the Canadian Arctic; GSC Bull. 243.

Klovan, J.E. and Embry, A.F. III

1971: Upper Devonian Stratigraphy, Northeastern Banks Island; Bull. Can. Pet. Geol., Vol. 19, No. 4, pp. 705-729.

Plauchut, B.P.

1971: Geology of the Sverdrup Basin; Bull. Can. Pet. Geol., Vol. 19, No. 3, pp. 659-679.

Plauchut, B.P. and Jutard, G.G.

1976: Cretaceous and Tertiary Stratigraphy, Banks and Eglinton Islands and Anderson Plains; Bull. Can. Pet. Geol., Vol. 24, No. 3, pp. 321-371.

Snowdon, L.R. and Roy, K.J.

1975: Regional Organic Metamorphism in the Mesozoic Strata of the Sverdrup Basin; Bull. Can. Pet. Geol., Vol. 23, No. 1, pp. 131-172.

Stuart-Smith, J.H. and Wennekens, J.H.N.

1977: Geology and Hydrocarbon Discoveries of Canadian Arctic Islands; Am. Assoc. Pet. Geol. Bull., Vol. 61, No. 1, pp. 1-28.

### ***Arctic Coastal Plain and Continental Shelf***

Sobczak, L.W.

1975: Gravity and Deep Structure of the Continental Margin of Banks Island and Mackenzie Delta; Can. J. Earth Sci., Vol. 12, pp. 248-395.

### ***Hudson Bay Basin and Lowlands***

Stanford, B.V. and Norris, A.W.

1975: Devonian Stratigraphy of the Hudson Platform: Part I, Stratigraphy and Economic Geology; GSC Memoir 379.

### ***Foxe Basin and Baffin Bay***

Keen, C.E. et al.

1972: Geophysical Studies in Baffin Bay and some Tectonic Implications; Can. J. Earth Sci., Vol. 9, No. 3.

Keen, C.E. and Barrett, D.L.

1973: Structural Characteristics of Some Sedimentary Basins in Northern Baffin Bay; Can. J. Earth Sci., Vol. 10, No. 7, pp. 1267-1278.

Trettin, H.P.

1975: Investigations of Lower Paleozoic Geology, Foxe Basin, Northeastern Melville Peninsula and Parts of Northwestern and Central Baffin Island; GSC Bull. 251.









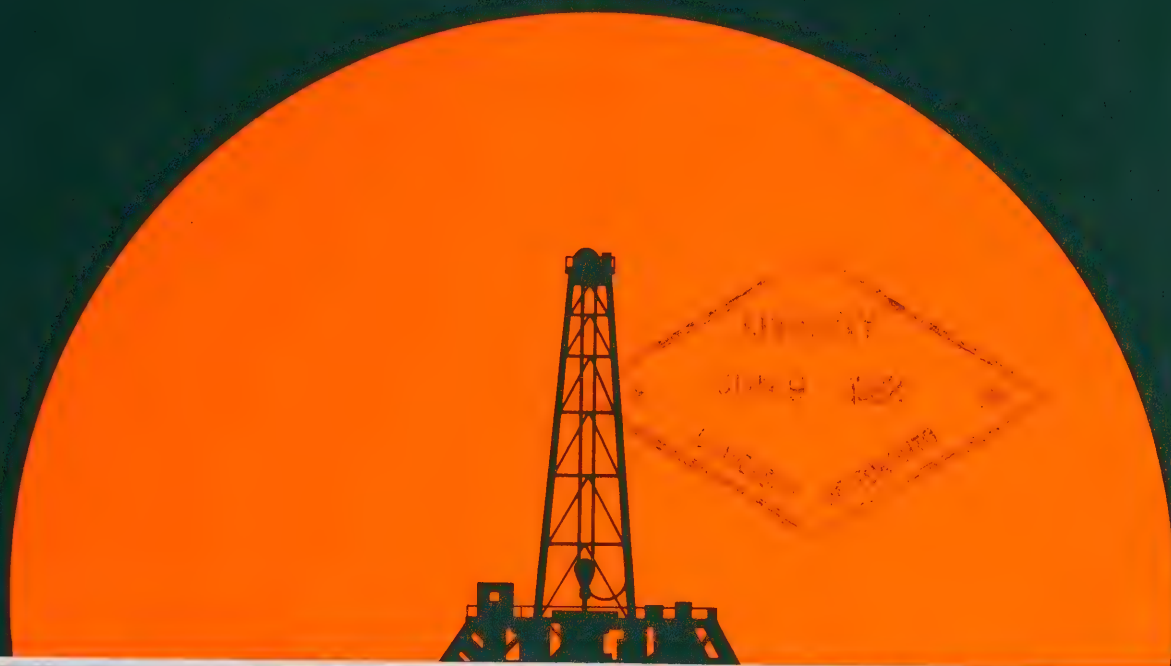
Indian and Northern  
Affairs Canada

Affaires indiennes  
et du Nord Canada

# Oil and Gas Activities 1980

Government  
Publications

CA1  
IA61  
- 032



Canada





# Oil and Gas Activities 1980

(Edition No. 17)

## **Report on the Activities in 1980 of the Oil and Gas Industry in the Yukon Territory and Northwest Territories**

Compiled by Oil and Gas Exploratory Operations  
Section  
Northern Non-Renewable Resources Branch

©Published under the authority of the  
Hon. John C. Munro, P.C., M.P.,  
Minister of Indian Affairs and  
Northern Development,  
Ottawa, 1981.  
QS-8298-000-EE-A1  
Catalogue No. R71-6/1980E  
ISBN 0-66211909-6

Cette publication peut aussi être obtenue en  
français sous le titre: *Pétrol et gaz Activités 1980*





# Table of Contents

<b>6</b>	<b>Preface</b>	<b>51</b>	<b>Net Cash Expenditures by Industry in 1980</b>
<b>7</b>	<b>Summary</b>	<b>54</b>	<b>Production, Processing and Refining</b>
<b>9</b>	<b>Introduction</b>	54	Norman Wells Oil Field
<b>11</b>	<b>Oil and Gas Discoveries and Reserves</b>	54	Pointed Mountain Gas Field
12	Geological Provinces North of 60 – Oil and Gas Discoveries and Recoveries	54	Kotanelee Gas Field
20	Report of the Reserves Committee of the Canadian Petroleum Association – 1980	<b>55</b>	<b>Pipelines and Development Projects</b>
22	Summary of Oil and Natural Gas Resources of Canada	55	Polar Gas Project
<b>23</b>	<b>Land Administration</b>	55	Petro-Canada Arctic Liquefied Natural Gas (LNG) Pilot Project
<b>28</b>	<b>Acts and Regulations</b>	57	Norman Wells Pipeline
28	Canada Oil and Gas Act	<b>59</b>	<b>Surveys and Studies</b>
28	Canada Oil and Gas Land Regulations	59	Geophysical Surveys
31	Canada Oil and Gas Geophysical Regulations	59	Research Programs
31	Canada Oil and Gas Pipeline Regulations	59	APOA and COOSRA
31	Canada Oil and Gas Production Regulations	59	Meteorological Station at Malloch Dome
31	Canada Oil and Gas Drilling Regulations	60	Eastern Arctic Marine Environmental Studies
<b>32</b>	<b>Revenues</b>	61	Lancaster Sound Regional Study
<b>38</b>	<b>Exploration, Discoveries and Drilling Operations</b>	<b>62</b>	<b>Appendix I</b>
38	Exploration		Sources of Information
38	Geological and Geophysical Surveys	<b>80</b>	<b>Appendix II</b>
38	Land Seismic Surveys		Directives
38	Marine Seismic Surveys	<b>83</b>	<b>Appendix III</b>
38	Drilling		Reporting Forms
38	Offshore	<b>85</b>	<b>Appendix IV</b>
42	Arctic Islands		Summaries of the Geological Provinces
42	Mainland	<b>88</b>	<b>Appendix V</b>
42	Mackenzie Delta		Selected Bibliography
42	Yukon		
42	Discoveries		
43	1981 Forecast		

# Tables and Illustrations

## Tables

11	Table 1	Area and Volume of Sediments
20	Table 2	Canadian Petroleum Association Estimate of Reserves
22	Table 3	Summary of Oil and Natural Gas Resources of Canada - 1975
23	Table 4	Number of Issued Permits and Leases with Relevant Extent as of December 31, 1980
33	Table 5	Gross Revenue, Oil and Gas (Calendar Year) 1974 to 1980
35	Table 6	Gross Revenue, Oil and Gas (Fiscal Year) 1973-74 to 1979-80
41	Table 7	1973-1980 Exploration Survey Statistics
42	Table 8	Wells Abandoned or Completed in 1980 (Drilling Statistics)
51	Table 9	Net Cash Expenditures by Industry in 1979 (Final)
52	Table 10	Net Cash Expenditures by Industry in 1980 (Preliminary)

## Illustrations

46		Oil and Gas Fields and Discoveries (Map) centrefold
10	Figure 1	Geological Basins (Map)
24	Figure 2	Area Held Under Oil and Gas Permit
25	Figure 3	Area under Lease - by Year
26	Figure 4	Land Holdings, 1980 (Map)
27	Figure 5	Permit Terms and Work Requirement Zones
29	Figure 6	Permit Terms and Deposit Requirements - per Acre
30	Figure 7	Disposal of Oil and Gas Rights (Flow Diagram)
34	Figure 8	Gross Revenue - Oil and Gas (Calendar Year)
36	Figure 9	Gross Revenue - Oil and Gas (Fiscal Year)
37	Figure 10	Value of Work Bonus Tenders - Oil and Gas
39	Figure 11	Exploratory Activity — Geological Crew Months — Land Seismic Crew Months
40	Figure 12	Exploration Activity — Seismic Line Kilometres
44	Figure 13	Wells Completed or Abandoned in 1980 Southern Northwest Territories and Yukon Territory (Map)
	Figure 14	Wells Completed or Abandoned in 1980 Mackenzie Delta - Beaufort Sea (Map)

48	Figure 15	Wells Completed or Abandoned in 1980 Arctic Islands (Map)
49	Figure 16	Wells Drilled
50	Figure 17	Depth Drilled
53	Figure 18	Oil and Gas Exploration Expenditures Submitted for Work Credits
58	Figure 19	Northern Pipelines (Map)
60	Figure 20	Eastern Arctic Marine Environmental Study (EAMES) (Map)

## Photographs

Frontispiece	False-Colour Infrared Satellite Photograph of the Eagle Plain Region, Yukon Territory
9 Photo 1	Drilling rig at Norman Wells, N.W.T. (Courtesy Esso Resources)
31 Photo 2	Esso Issungnak 2-O-61 Artificial Island Well (Courtesy Esso Resources)
32 Photo 3	Esso Issungnak 2-O-61 Artificial Island Well (Courtesy Esso Resources)
54 Photo 4	Esso Issungnak 2-O-61 Artificial Island Well (Courtesy Esso Resources)
59 Photo 5	Esso Alerk Artificial Island (Courtesy Esso Resources)



# Preface

This report covers oil and gas activities north of 60° for the year 1980. All aspects of these operations in the Yukon and Northwest Territories are administered by the Northern Non-Renewable Resources Branch, Department of Indian Affairs and Northern Development. It is the intent of the Department to provide for the orderly exploration and exploitation of oil and gas, thereby achieving local benefits to the specific areas involved as well as benefitting the people of Canada in general through the revenues accruing to the Crown.

As of March 1, 1981 the minister and departmental officers responsible for the administration of oil and gas resources in the Northwest Territories, Yukon Territory and the northern offshore areas were:

Minister — The Honourable John C. Munro  
Deputy Minister — Paul M. Tellier  
Assistant Deputy Minister (Northern Affairs) —  
G.N. Faulkner  
Director, Northern Non-Renewable Resources  
Branch — Dr. H.W. Woodward

## Oil and Gas Lands Division

Chief — P. Sullivan  
Head, Oil and Gas Rights Section — J.A.S. Barrett  
Head, Production and Royalty Section —  
Appointment Pending

## Oil and Gas Resource Evaluation Division

A/Chief — S.A. Kanik  
Head, Oil and Gas Exploratory Operations Section  
— S.A. Kanik

## Oil and Gas Engineering Division

Chief — Appointment Pending  
Head, Drilling and Completion Engineering Section  
— Appointment Pending  
Head, Reservoir Engineering Section — D. Boggs  
Head, Pipeline and Transportation Engineering  
Section — T.G. Starr

Scientific Research and Special Project  
Co-ordinator — Appointment Pending  
Regional Oil and Gas Conservation Engineer  
(Yellowknife) — Appointment Pending  
Oil and Gas Conservation Engineer —  
Appointment Pending.

## Oil and Gas Divisions

### Responsibilities

The Oil and Gas Lands Division manages the government's proprietary interest in oil and gas. It handles sales of oil and gas rights, issues permits and leases, maintains a registry of oil and gas rights, and monitors royalty and other revenue functions directly resulting from oil and gas operations.

The Oil and Gas Resources Evaluation Division conducts economic and geological appraisals of individual parcels of land and evaluates oil and gas potential in the North. It assesses exploratory programs, receives and maintains technical data from these programs, maintains a library of exploratory reports for use by the public, and processes the geoscience data to provide information on potential resources and reserves and land values.

The Oil and Gas Engineering Division is responsible for departmental activities concerning safety and control of drilling and production processes and of the gathering, storage and transmission of hydrocarbons from the territories and adjacent offshore areas. The division ensures that maximum economic recovery of oil and gas is achieved, that all underground fluids not produced are confined to the strata in which they were found, and that proper sharing occurs between the various producers. It ensures that timely recovery enhancement programs are instituted and that oil and gas treatment plants incorporate good engineering practices.

# Summary

In the vast area of Canada North of 60° several new finds of oil, gas or oil and gas were discovered during 1980. In the Sverdrup Basin (offshore) two potential gas and oil finds were made and gas was recovered in one well in the Baffin Bay-Davis Strait region. In the Interior Plains of the Northwest Territories three new gas finds were reported, and two new oil and gas finds were made in the Mackenzie Delta.

Bill C-48, the proposed *Canada Oil and Gas Act*, is a major element in the government's announced National Energy Program that was tabled in the House of Commons in December 1980. It lays down explicit requirements and conditions for the acquisition of oil and gas land rights and for the exploration for oil and gas resources in Canada's frontier regions. It will introduce a new system of grants to replace the existing permit and lease arrangement. Although its terms may reduce the extent and number of land holdings at first, it is expected to lead in the long run to a more orderly assessment of northern resources.

Under the authority of the *Canada Oil and Gas Land Regulations*, five exploration agreements, covering about 11 million hectares in Baffin Bay and Davis Strait were concluded with Petro-Canada in 1980 under preferential rights contained in the 1977 amendments to the Regulations. Other negotiations were in progress at year's end. Most existing permits matured during 1980 and thus the total area of land holdings decreased. The area under lease increased, however. Although some leases were granted for areas in the Southern Territories, exploratory operations North of 60° continue to be mainly in the more remote and costly areas of the Arctic Islands and the Beaufort Sea.

The Department of Indian Affairs and Northern Development has worked jointly with the Department of Energy, Mines and Resources during the past several years to draft suitable up-to-date regulations to be applied under the *Canada Oil and Gas Geophysical Regulations*, the *Canada Oil and Gas Pipeline Regulations*, and the *Canada Oil and Gas Structures Regulations*. The *Canada Oil and Gas Production Regulations*, redrafted in 1979, were resubmitted to the industry task force in 1980 for review and comment.

Revenues for the calendar year 1980 were about the same as those for 1979, but revenues for the fiscal year 1980-81 showed an increase of about \$2 million. The cumulative work-bonus to the end of the calendar year was approximately \$59 million, an increase of \$100 000 over 1978 — due to one single exploration agreement issued in 1979.

Very few geological surveys were carried out during 1980 and those that were, were limited to short programs on the Northwest Territories Mainland and the Arctic Islands. Land seismic surveys, however, increased both in number and length, and were carried out on the Mainland, in the Mackenzie Delta and in the Arctic Islands. Marine seismic surveys included the 100-mile survey of the Mackenzie River at Norman Wells, a number of surveys in the Beaufort Sea and in the Baffin Bay-Davis Strait area. However, the total coverage by marine seismic surveys in 1980 showed a decline from the total of 1979.

Drilling activity, on the contrary, increased with wells being drilled or deepened in both the Western and Eastern Arctic, in the Arctic Islands, on the Mainland and in the Yukon. In the Western Arctic where artificially created islands are used for drilling, more were being built, while in the Arctic Islands ice platforms were used for offshore drilling. Eight discoveries or extensions to existing fields resulted from the 1980 drilling operations. In all, 19 wells were drilled with a total depth of 42 325 metres.



It is expected that the general activity in 1981 will be similar to that of 1980, with work mainly in the Arctic Islands, the Mackenzie River and Delta and the Beaufort Sea.

During 1980, net expenditures by industry on oil and gas exploration North of 60° increased over the amount spent in 1979.

Reserves of both oil and gas, as estimated by the Canadian Petroleum Association for the area, declined in 1980, oil reserves more severely than those of gas. This was due, in part at least, to production and to revisions of calculated reserves and tended to offset any increases resulting from extensions of existing fields or new discoveries.

Oil production at Norman Wells was higher in 1980 but gas production showed a decrease over 1979. Production of gas also decreased at the Pointed Mountain Gas Field. In the Yukon although the Kotaneelee field came on stream as a result of the completion of the gas gathering and gas dehydration systems in 1977, production is limited due to lack of markets.

A proposal to construct a pipeline to transport gas from the Arctic Islands and the Mackenzie Delta-Beaufort Sea region, known as the Polar Gas Project, has been reviewed and will be resubmitted to the National Energy Board for approval. The underwater crossings have been reduced to two and it is considered the pipeline might possibly be able to be completed within seven to ten years.

With the increased output anticipated at Norman Wells, consideration is being given to the construction of a pipeline from there to Northern Alberta. Interprovincial Pipelines has applied to the National Energy Board for permission to build this line.

The Petro-Canada application to the Board for permission and authority to transport natural gas from the Arctic Islands by tanker in liquefied form (LNG) is under consideration.

There were fewer participation and research programs under way in 1980 than in 1979. Ice studies were continued in the Beaufort Sea by Esso Resources and Dome Petroleum. Dome also carried out ice-breaking studies in the region during the winter. The seismic studies undertaken by Geophysical Services Incorporated in the Beaufort Sea, cut short in 1980 by the early arrival of winter ice, will continue in 1981.

The Canadian Offshore Oil Research Association (COOSRA), formed to further understanding of oil spills and the best methods of coping with them, has taken over responsibility for a number of projects formerly handled by APOA. Its Baffin Island Oil Spill study (BIOS) was completed during 1980.

The unmanned weather station at Malloch Dome, Ellef Ringnes Island, installed by Trans Canada Pipelines to collect data required for the design and construction of an LNG port in the area, began operation in 1980. Its weather data is reported directly to the American Geostationary Operational Satellite (GOES). The information is ultimately relayed to Edmonton where weather forecasts for the High Arctic are completed.

The program of Eastern Arctic Marine Environmental Studies (EAMES) set up in 1977 continued in 1980. The aim is to provide data from areas of the Eastern Arctic, notably the east coast of Baffin Island, on the advisability of granting drilling authorities in the region. It is the first program to consider the character and needs of the total ecology of a region rather than just specific, isolated, scattered areas within it. It involves both industry and federal departments, with industry bearing the larger share of the cost.

The Lancaster Sound Regional Study, initiated in 1977 is expected to produce a green paper by the end of 1981. The work is being carried out by an interdisciplinary working group of representatives from five federal departments to consider optimum future uses of the land and sea resources of the area. Native residents of the area are included on the working group.



# Introduction



The uncertainty and confusion that characterized much of the Canadian oil and gas industry during 1980, had little or no effect on activities North of 60° where all operations are under the direction of the federal government. Surveys continued as usual although some showed a continuation of the slow decline of previous years. New wells were drilled, some new oil and gas finds were made and plans continued for transporting gas south from the Arctic Islands. Research programs continued, some already nearing completion. It is expected that the oil and gas activity in the region in 1981 will be on a scale similar to that experienced in 1980.

Photo 1  
Drilling rig at Norman Wells, N.W.T. (Courtesy Esso Resources)

Figure 1  
Geological Provinces



# Oil and Gas Discoveries and Reserves

The area of Canada north of 60° covers approximately 3 800 000 km<sup>2</sup>, of which nearly one-third is underlain by sedimentary rocks. A comparison of the area and volume of sediments in the Western Provinces, the Yukon and the Northwest Territories (including the Arctic Islands) is given in Table 1. (North of 60° area and volume are for Canada lands; that is, lands under the jurisdiction of the government of Canada.)

**Table 1**  
Area and Volume of Sediments

Regions	Total Area km <sup>2</sup>	Volume of Sediments km <sup>3</sup>
Manitoba & Saskatchewan	570 000	688 000
Alberta	582 000	1 390 000
British Columbia	359 000	1 242 000
Yukon & Northwest Territories Mainland*	1 402 000	1 755 000
Arctic Archipelago**	1 670 000	5 314 000
	4 583 000	10 389 000

\* Includes Beaufort Sea area, but excludes all Arctic Stable Platform.

\*\*Includes the Arctic Stable Platform and all offshore areas except Beaufort Sea.

For convenient reference, the area north of 60° has been divided into 13 major geological provinces and a number of sub-provinces as shown in Figure 1. More details of these geological provinces are given in Appendix IV, *Summaries of the Geological Provinces*. A short list of relevant references to the geology of the area is given in Appendix V. The discoveries map (at centre fold) show the locations of all oil and gas fields, including the 1980 discoveries.

The distribution of oil and gas discoveries and recoveries to the end of 1980, and the potential for future discoveries in the various geological provinces, are outlined in the following pages.



## Geological Provinces North of 60° — Oil and Gas Discoveries and Recoveries

(\*indicates discovery/recovery in 1980)

(DST — Drillstem Test; FT — Flow Test; AOF — Absolute Open Flow; CCT — Closed Chamber Test; OTS — Oil to Surface)

Well Name	Location	Well Status	Reserve Status	Horizon	Lithology	Spud Date	Completion Date	Potential
1. Arctic Stable Platform — only four wells have been drilled to date, all unsuccessful.								
2. Franklinian Geosyncline — significant quantities of light gravity crude oil have been recovered from Middle Devonian carbonates on Cameron Island.								
<b>Cameron Island</b>								
Panarctic et al Bent Horn N-72	N-72-76-30-103-30	Potential Oil & Gas Well	Oil Show	Blue Fiord	Carbonate	73-11-24	74-04-06	79.5 m <sup>3</sup> /d test
Panarctic et al Bent Horn F-72A	F-72-76-30-103-30	Potential Oil & Gas Well	Oil Show	Blue Fiord	Carbonate	75-05-21	75-12-19	70.8 m <sup>3</sup> /d oil DST
Panarctic et al W. Bent Horn A-02	A-02-76-30-104-00	Potential Oil & Gas Well	Oil Discovery	Blue Fiord	Carbonate	76-05-06	76-08-01	Max. 1256 m <sup>3</sup> /d production test

3. Sverdrup Basin — ten gas fields have been discovered to date. Recoveries of crude oil have been recorded from Ellesmere and Thor Islands, and to the east of Lougheed Island.

### Gas Discoveries

<b>Melville Island</b>								
Panarctic Drake Point N-67	N-67-76-30-108-30	Abandoned	Gas Discovery	Jurassic	Sandstone	69-04-14	69-09-02	Abandoned after blow-out
Panarctic Drake Point L-67	L-67-76-30-108-30	Potential Dual Gas	Gas Dev.	Jurassic Bjorne	Sandstone	69-09-28	70-02-28	DST 282 10 <sup>3</sup> m <sup>3</sup> /d (Jurassic)
Panarctic et al Drake F-16	F-16-76-30-108-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	72-05-10	72-06-16	AOF 7466 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Drake B-44	B-44-76-30-108-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	72-09-23	72-10-22	DST 155 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Drake D-68	D-68-76-30-108-30	Potential Gas	Gas. Dev.	Jurassic Bjorne	Sandstone	73-06-07	74-03-25	DST 245 10 <sup>3</sup> m <sup>3</sup> /d DST 1.1 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Drake E-78	E-78-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	74-05-02	74-05-27	DST 135 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Drake D-73	D-73-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	75-04-23	75-05-10	DST 228 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Drake F-76	F-76-76-30-108-00	Suspended Gas	Gas Dev.	Jurassic	Sandstone	78-03-02	78-04-30	AOF 2169 10 <sup>3</sup> m <sup>3</sup> /d @88.0 kPa
Panarctic et al East Drake I-55	I-55-76-30-107-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	75-03-06	75-04-16	AOF 1634 10 <sup>3</sup> m <sup>3</sup> /d critical flow proved

Panarctic et al W. Hecla N-52	N-52-76- 30-110-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	74-03-05	74-04-15	AOF 1465 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Hecla F-62	F-62-76- 30-110-00	Potential Gas	Gas Discovery	Jurassic	Sandstone	72-11-11	72-12-12	AOF 2705 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Hecla I-69	I-69-76- 20-110-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	73-02-22	73-04-11	DST 220 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al E. Hecla C-32	C-32-76- 30-110-00	Potential Gas	Gas Discovery	Jurassic	Sandstone	75-11-07	75-12-10	DST 239 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al W. Hecla P-62	P-62-76- 30-110-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	76-01-07	76-02-22	DST 149 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al W. Hecla M-25	M-25-76- 30-111-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	76-03-14	76-04-18	DST 152 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Roche Pt O-43	O-43-75- 50-109-30	Abandoned Gas	Gas Discovery	Triassic	Sandstone	78-01-18	78-04-18	DST 5.6 10 <sup>3</sup> m <sup>3</sup> /d
<b>Thor Island</b>								
Panarctic et al Thor H-28	H-28-78- 10-103-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	73-02-28	73-05-10	Flow test to 1549 10 <sup>3</sup> m <sup>3</sup> /d
<b>Ellef Ringnes Island</b>								
Panarctic et al Kristoffer Bay B-06	B-06-78- 20-102-30	Potential Gas	Gas Discovery	Heiberg	Sandstone	71-11-09	72-03-17	DST 281 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Jackson Bay G-16A	G-16-78- 10-101-00	Potential Gas	Gas Discovery	Heiberg	Sandstone	76-03-16	76-04-30	DST 207 10 <sup>3</sup> m <sup>3</sup> /d
<b>King Christian Island</b>								
Panarctic King Christian D-18	D-18-77- 50-101-00	Abandoned	Gas Discovery	Heiberg	Sandstone	70-10-14	71-01-25	Abandoned after blowout
Panarctic King Christian D-18A	D-18-77- 50-101-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	70-11-26	71-03-15	AOF 7348 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al King Christian N-06	N-06-77- 50-101-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	71-05-13	71-09-20	AOF 9579 10 <sup>3</sup> m <sup>3</sup> /d
Dome Arctic Ventures Wallis K-62	K-62-78- 00-102-00	Potential Gas	Gas Discovery	Heiberg	Sandstone	72-11-27	73-02-21	DST 350 10 <sup>3</sup> m <sup>3</sup> /d
<b>Offshore Sverdrup</b>								
Panarctic AIEG Whitefish H-63	H-63-77- 20-106-30	Potential Gas	Gas Discovery	Awingak Heiberg	Sandstone	79-02-18	79-05-21	DST 228 10 <sup>3</sup> m <sup>3</sup> /d
*Panarctic AIEG Whitefish 2H-63	H-63-77- 20-106-30	Potential Gas	Gas Dev.	Isachsen Awingak U. Heiberg L. Heiberg	Sandstone	79-12-03	80-05-15	

## Crude Oil Recoveries

<b>Ellesmere Island</b>								
Panarctic Romulus C-42	C-42-80- 00-84-00	Suspended	Oil & Gas Show	Jurassic Schei Point Bjorne	Sandstone	72-01-29	72-07-25	Area has potential
<b>Thor Island</b>								
Panarctic et al Thor P-38	P-38-78- 10-103-00	Suspended	Oil Show	Heiberg	Sandstone	72-04-06	72-05-10	Thin Oil leg on water
<b>Offshore Sverdrup</b>								
*Panarctic AIEG Dome Char G-07	G-07-77- 40-99-30	Potential Gas	Oil and Gas Discovery	Awingak U. Heiberg	Sandstone	80-02-06	80-04-22	
*Panarctic AIEG Dome Balaena D-58	D-58-77- 40-100-00	Potential Oil	Oil Discovery	Isachsen	Sandstone	80-02-06	80-04-27	

4. Arctic Coastal Plain — no successful wells to date.

5. Banks Basin — no hydrocarbon discoveries to date, but the area is considered to have a moderate potential for hydrocarbon accumulation.

6. Baffin Bay-Davis Strait — this “province” lies entirely offshore and to date has been explored by only two wildcat wells. It contains several areas that hold promise for future hydrocarbon discoveries: the Thule Basin off Greenland, Lancaster Delta, Home Bay Delta, Cumberland Delta, Lancaster Sound and Jones Sound.

*Aquitaine et al Hekja O-71	O-71-62- 20-62-45	Potential Gas	Gas Discovery	Tertiary	Sandstone	79-07-29	80-10-07	
--------------------------------	----------------------	------------------	------------------	----------	-----------	----------	----------	--

7. Mackenzie-Beaufort Basin — oil and gas have been found in Paleozoic carbonates and in Lower Cretaceous and Tertiary sands. All these finds are in the Mackenzie Delta section, Adgo and Netserk being drilled from man-made islands in the shallow waters of the Beaufort Sea.

## Crude Oil Discoveries

<b>Mackenzie Delta — Tuktoyaktuk Peninsula</b>								
IOE Atkinson H-25	H-25-69- 50-131-45	Abandoned	Potential Oil Well	Lower Cretaceous	Sandstone	69-12-14	70-02-26	500.9 m <sup>3</sup> /d calc. 24.3° API
IOE Mayogiak J-17	J-17-69- 30-132-45	Abandoned	Potential Oil Well	Devonian & Lower Cretaceous	Carbonate & Sandstone	71-04-03	71-08-06	1163.8 m <sup>3</sup> /d 3.6° API
Imp. Ivik J-26	J-26-69- 40-134-15	Suspended	Potential Oil & Gas Well	Tertiary	Sandstone	72-04-08	72-09-30	849.8 m <sup>3</sup> /d calc. 24° API
Imp. Ivik K-54	K-54-69- 40-134-15	Abandoned	Potential Oil	Tertiary	Sandstone	73-03-30	73-06-08	131.9 m <sup>3</sup> /d calc. 24° API
Imp Adgo F-28	F-28-69- 30-135-45	Plugged & Abandoned	Oil & Gas	Tertiary	Sandstone	73-12-28	74-03-19	238.5 m <sup>3</sup> /d 17.5° API



Gulf Mobil Parsons N-17	N-17-69- 00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	75-12-18	76-04-13	DST 634 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons D-20	D-20-69- 00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	76-04-21	76-11-22	DST 578 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Imp. Shell Reinder F-36	F-36-69- 10-134-30	Suspended	Gas	Tertiary	Sandstone	73-03-13	73-06-05	DST 138 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Siku C-11	C-11-69- 10-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	75-12-26	76-03-22	DST 874 10 <sup>3</sup> m <sup>3</sup> /d Calc.
IOE Taglu C-42	C-42-69- 30-134-45	Suspended	Condensate	Eocene	Sandstone	72-04-30	72-11-18	DST 691 10 <sup>3</sup> m <sup>3</sup> /d Calc.
IOE Taglu W. P-03	P-03-69- 30-135-00	Suspended	Gas	Eocene	Sandstone	71-12-12	73-03-29	178 10 <sup>3</sup> m <sup>3</sup> /d Max. flow rate
IOE Taglu D-43	D-43-69- 30-134-45	Suspended	Gas	Eocene	Sandstone	73-03-23	73-09-11	AOF 854 10 <sup>3</sup> m <sup>3</sup> /d
IOE Mallik L-38	L-38-69- 30-135-00	Abandoned	Potential Oil	Tertiary	Sandstone	71-12-24	72-04-05	CCT/.250 m <sup>3</sup> /d calc.
Imp. Taglu H-54	H-54-69- 30-134-45	Suspended	Gas	Tertiary	Sandstone	76-12-02	77-04-05	DST 71 10 <sup>3</sup> m <sup>3</sup> /d
Imp. Netserk F-40	F-40-69- 40-135-45	Suspended	Gas	Tertiary	Sandstone	75-11-08	76-05-09	DST 251 10 <sup>3</sup> m <sup>3</sup> /d
Shell Kumak K-16	K-16-69- 20-135-00	Suspended	Gas	Tertiary	Sandstone	75-02-23	75-07-13	DST 336 10 <sup>3</sup> m <sup>3</sup> /d
Shell Kumak E-58	E-58-69- 30-135-00	Suspended	Gas	Tertiary	Sandstone	77-02-28	77-06-08	DST 482 10 <sup>3</sup> m <sup>3</sup> /d
Shell Niglintgak H-30	H-30-69- 20-135-15	Suspended	Gas	Tertiary	Sandstone	72-10-24	73-04-07	DST 448 10 <sup>3</sup> m <sup>3</sup> /d
Shell Niglintgak B-19	B-19-69- 20-135-15	Suspended	Gas	Tertiary	Sandstone	75-10-18	76-02-22	DST 243 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Siku A-12	A-12-69- 10-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	76-04-14	76-07-26	DST 1 325 10 <sup>3</sup> m <sup>3</sup> /d (est)
Gulf Mobil Siku E-21	E-21-69- 10-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	77-04-17	77-06-21	DST 815 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Imp. Shell Titalik K-26	K-26-69- 10-135-00	Abandoned	Gas	Tertiary	Sandstone	72-10-17	73-02-20	DST 396 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Ya Ya A-28	A-28-69- 20-134-30	Suspended	Gas	Tertiary	Sandstone	74-02-28	74-07-06	DST 319 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Ya Ya P-53	P-53-69- 20-134-30	Suspended	Gas	Tertiary	Sandstone	72-12-08	73-03-20	DST 229 10 <sup>3</sup> m <sup>3</sup> /d
IOE Taglu G-33	G-33-69- 30-134-45	Suspended	Gas	Tertiary	Sandstone	71-04-13	71-08-18	DST 809 10 <sup>3</sup> m <sup>3</sup> /d

Imp Adgo J-27	J-27-69-30-135-45	Abandoned	Gas	Tertiary	Sandstone	79-04-05	79-08-07	
Shell Kugpik O-13	O-13-69-20-135-15	Suspended	Oil	Lower Cretaceous	Sandstone	73-03-26	73-09-30	461.1 m <sup>3</sup> /d 50° API
Shell Kumak J-06	J-06-69-20-135-00	Suspended	Oil	Tertiary	Sandstone	73-11-24	74-05-01	795 m <sup>3</sup> /d 27.1° & 31.3° API
Shell Niglintgak M-19	M-19-69-20-135-15	Suspended	Oil & Gas	Tertiary	Sandstone	74-06-01	75-01-25	O.T.S. 18.8 – 32° API
Sun et al Garry P-04	P-04-69-30-135-30	Suspended	Oil & Gas	Tertiary	Sandstone	75-08-25	76-01-05	O.T.S. DST
Gulf Mobil Kamik D-48	D-48-69-00-133-15	Suspended	Oil & Gas	Lower Cretaceous	Sandstone	75-12-23	76-04-04	O.T.S. DST
<b>Beaufort Sea</b> Dome Hunt Nektoralik K-59	K-59-70-30-136-00	Abandoned	Oil & Gas	Tertiary	Sandstone	77-08-08	77-10-17	O.T.S. DST
Dome Hunt Kopanoar M-13	M-13-70-30-135-00	Abandoned	Oil	Tertiary	Sandstone	76-09-27	78-10-16	O.T.S. DST
*Esso et al Issungnak O-61	O-61-70-10-134-00	Abandoned Oil and Gas Discovery	Oil and Gas	Tertiary	Sandstone	80-02-06	80-07-08	
*Dome Gulf Tarsiut A-25	A-25-70-00-136-15	Suspended	Oil and Gas	Tertiary	Sandstone	78-10-18	80-07-30	

## Gas Discoveries

### Mackenzie Delta — Tuktoyaktuk Peninsula

Gulf Mobil Parsons F-09	F-09-69-00-133-30	Suspended	Gas & Condensate	Lower Cretaceous	Sandstone	71-01-20	72-04-19	DST 485 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons N-10	N-10-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	73-02-14	73-05-29	FT 958 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons L-37	L-37-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	76-12-26	77-04-02	DST 642 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons P-41	P-41-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	76-12-29	77-04-05	DST 190 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons A-44	A-44-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	75-04-09	75-07-22	DST 423 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons P-53	P-53-69-00-130-30	Suspended	Gas & Condensate	Lower Cretaceous	Sandstone	73-12-22	74-04-09	DST 234 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons O-27	O-27-69-00-133-30	Suspended	Gas	Cretaceous	Sandstone	74-03-23	74-08-30	DST 77 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons L-43	L-43-69-00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	75-12-10	76-03-04	DST 781 10 <sup>3</sup> m <sup>3</sup> /d

Sun et al Garry P-04	P-04-69-30-135-30	Suspended	Oil & Gas	Tertiary	Sandstone	75-08-25	76-01-05	DST 491 10 <sup>3</sup> m <sup>3</sup> /d
Sun et al Garry G-07	G-07-69-30-135-30	Suspended	Gas Dev.	Tertiary	Sandstone	78-02-10	78-05-13	DST 57 m Cond.
Imp. Isserk E-27	E-27-70-00-134-15	Abandoned Gas	Gas Discovery	Tertiary	Sandstone	77-12-04	78-05-04	—
<b>Beaufort Sea</b> Dome Hunt Nektoralik K-59	K-59-70-30-136-00	Abandoned	Oil & Gas	Tertiary	Sandstone	77-08-08	77-10-17	—
Dome et al Ukalerk C-50	C-50-70-10-132-30	Abandoned	Gas	Tertiary	Sandstone	77-07-19	77-10-03	—
Dome Gulf et al Ukalerk 2C-50	C-50-70-10-132-30	Suspended	Gas	Tertiary	Sandstone	78-07-10	78-10-16	—

## 8. Interior Plains

**Great Slave Plain** — gas pools have been discovered in porous dolomites and limestones of Middle Devonian age.

Briggs Rabbit Lake No. 1	O-16-61-00-118-45	Potential Gas Well	Gas Discovery	Sulphur Point	Limestone	55-02-04	55-03-30	AOF 57 10 <sup>3</sup> m <sup>3</sup> /d (est)
Briggs Rabbit Lake No. 2	B-07-61-00-118-45	Potential Gas Well	Gas Dev.	Sulphur Point	Limestone	57-02-09	57-03-14	AOF 170 10 <sup>3</sup> m <sup>3</sup> /d (est)
Home Signal CSP Celibeta No. 2	H-78-60-10-122-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	59-12-26	60-03-24	AOF 226 10 <sup>3</sup> m <sup>3</sup> /d
H.B. Cameron Hills A-05	A-05-60-10-117-30	Potential Gas Well	Gas Discovery	Slave Point Sulphur Point	Limestone Dolomite	68-01-28	68-02-24	DST 232 10 <sup>3</sup> m <sup>3</sup> /d
*Paramount et al Cameron Hills J-62	J-62-60-10-117-30	Potential Gas Well	Gas Discovery	Sulphur Point	Limestone	80-02-11	80-03-11	—
*Paramount et al Cameron Hills M-31	M-31-60-10-117-00	Potential Gas Well	Gas Discovery	Keg River	Dolomite	79-04-02	80-07-21	—
H.B. Pan Am S. Island R. M-41	M-41-60-10-121-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	64-02-03	64-04-23	DST 161 10 <sup>3</sup> m <sup>3</sup> /d
H.B. Amoco S. Island R. M-52	M-52-60-10-121-00	Abandoned	Gas Discovery	Slave Point	Limestone	73-01-21	73-02-21	DST 37 10 <sup>3</sup> m <sup>3</sup> /d
Pacific Amoco Tathlina N-18	N-18-60-20-118-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	73-01-28	73-02-19	DST 51 10 <sup>3</sup> m <sup>3</sup> /d
Shell H.B. Grumbler G-63	G-63-60-20-115-45	Abandoned	Potential Gas Discovery	Slave Point	Limestone	69-02-14	69-03-16	DST 282 10 <sup>3</sup> m <sup>3</sup> /d
Sun Netla C-07	C-07-60-50-122-45	Potential Gas Well	Gas Discovery	Sulphur Point	Limestone	61-01-20	61-04-05	AOF 677 10 <sup>3</sup> m <sup>3</sup> /d



Texaco Bovie Lake J-72	J-72-60- 10-122-45	Potential Gas Well	Gas Discovery	Nahanni	Dolomite	70-01-06	70-01-18	DST 74 10 <sup>3</sup> m <sup>3</sup> /d
Union Pan Am Trainor C-39	C-39-60- 20-120-30	Potential Gas Well	Gas Discovery	Sulphur Point	Carbonate	65-01-29	65-03-15	DST 226 10 <sup>3</sup> m <sup>3</sup> /d

#### Great Bear Plain

No discoveries to date

#### Mackenzie Plain

Oil is produced at Norman Wells from the Devonian Kee Scarp formation, and additional hydrocarbon shows have been encountered in the Cretaceous and Silurian age formations of this "province".

### Crude Oil Discoveries

#### Norman Wells Oil Field

Northwest Discovery No. 1	P-37-65- 20-126-45	Abandoned	Oil Discovery	Devonian Canol	Fractured Shale	20-04-14	44-08-06	2.0 m <sup>3</sup> /d
Northwest Discovery No. 2	P-37-65- 20-126-45	Abandoned	Oil Discovery	Kee Scarp (Givetian)	Limestone	24-07-01	24-09-12	12.0 m <sup>3</sup> /d

96 additional wells were drilled to develop the field.

#### Peel Plain

No discoveries here as yet, but hydrocarbon shows have been encountered in Lower Devonian formations.

#### Anderson Plain

One gas discovery has been made at Tedji Lake, and several other hydrocarbon shows have been encountered.

Ashland et al Tedji Lake F-24	F-24-67- 50-126-45	Suspended	Gas	Basal Cambrian	Sandstone	74-02-13	74-03-31	DST 127 10 <sup>3</sup> m <sup>3</sup> /d
----------------------------------	-----------------------	-----------	-----	-------------------	-----------	----------	----------	--

9. Liard Plateau and Range — gas was produced in this province at the Beaver River (field) and is being produced at Pointed Mountain field from dolomites of the Nahanni Formation of Middle Devonian age. The Beaver River field (Y.T. portion) produced gas from Mississippian sands. Gas has also been discovered at Kotaneelee and La Biche.

#### Northwest Territories

C.P.O.G. et al La Biche F-08	F-08-60- 40-124-30	Suspended	Gas Discovery	Middle Devonian	Argilla- ceous Limestone	71-02-25	71-03-19	DST 82 10 <sup>3</sup> m <sup>3</sup> /d
Pan Am Pointed Mountain G-62	G-62-60- 30-123-45	Gas Well	Gas Dev.	Middle Devonian Carbonate	Dolomite	68-07-09	69-06-23	Flow back 339 10 <sup>3</sup> m <sup>3</sup> /d
Pan Am Pointed Mountain K-45	K-45-60- 30-123-45	Gas Well	Gas Dev.	Middle Devonian Carbonate	Dolomite	67-09-15	68-05-08	AOF 2 130 10 <sup>3</sup> m <sup>3</sup> /d
Pan Am Pointed Mountain O-46	O-46-60- 30-123-45	Gas Well	Gas Dev.	Devonian Nahanni	Dolomite	69-03-29	71-10-02 Extended Standby	AOF 545 10 <sup>3</sup> m <sup>3</sup> /d
Pan Am Pointed Mountain P-53	P-53-60- 30-123-45	Gas Well	Gas Discovery	Devonian Nahanni	Dolomite	66-02-06	67-02-22	AOF 1979 10 <sup>3</sup> m <sup>3</sup> /d
Amoco B-2 Pointed Mountain F-38	F-38-60- 30-123-45	Gas Well	Gas Dev.	Devonian Nahanni	Dolomite	72-08-22	73-10-07	AOF 818 10 <sup>3</sup> m <sup>3</sup> /d

Amoco Pointed Mountain A-55	A-55-60-30-123-45	Gas Well	Gas Dev.	Devonian Nahanni	Dolomite	74-03-01	74-08-08	Production tested 127 10 <sup>3</sup> m <sup>3</sup> /d
*Paramount et al Liard D-29	D-29-60-30-123-00	Potential Gas Well	Gas Discovery	Arnica	Dolomite	79-01-28	80-07-24	
<b>Yukon Territory</b> Canada Southern et al North Beaver River YT I-27	I-27-60-10-124-00	Suspended	Extension Test Gas Well	Middle Devonian	Carbonate	63-03-24	64-09-29	AOF 43 10 <sup>3</sup> m <sup>3</sup> /d
Columbia Gas et al Kotaneelee H-38	H-38-60-10-124-00	Gas Well	Gas Dev.	Middle Devonian	Carbonate	77-04-06	77-10-29	Production tested 592 10 <sup>3</sup> m <sup>3</sup> /d
Columbia et al Kotaneelee E-37	E-37-60-10-124-00	Suspended Gas Well	Gas Dev.	Middle Devonian	Carbonate	78-01-21	78-12-05	
Columbia et al Kotaneelee YT I-48	I-48-60-10-124-00	Gas Well	Gas Dev.	Nahanni Arnica	Dolomite	79-04-18	80-04-11	AOF 12,931 10 <sup>3</sup> m <sup>3</sup> /d
Pan Am Beaver River YT G-01	G-01-60-10-124-15	Abandoned Gas Well	Gas Producer	Mississippian & Nahanni	Sandstone and Carbonate	68-06-12	69-03-10	AOF 192 10 <sup>3</sup> m <sup>3</sup> /d AOF 1120 10 <sup>3</sup> m <sup>3</sup> /d

**10. Eagle Plain — significant hydrocarbon shows have been encountered, but no commercial discoveries have been reported.**

Canoe River Chance YT J-19	J-19-66-10-137-30	Potential Gas & Oil	Oil & Gas Discovery	Carbon-iferous Hart River	Conglom-eratic Sandstone	67-12-14	68-02-17	DST 184 10 <sup>3</sup> m <sup>3</sup> /d
Socony Mobil WM Chance YT G-08	G-08-66-10-137-30	Potential Oil Well	Oil & Gas Discovery	Cretaceous Carbon-iferous Hart River	Sandstone Conglom-eratic Sandstone	64-12-04	65-02-15	DST 93 10 <sup>3</sup> m <sup>3</sup> /d 360 m oil
Socony Mobil WM Birch YT B-34	B-34-66-10-136-45	Potential Gas Well	Gas Discovery	Carbon-iferous Hart River	Conglom-eratic Sandstone	64-08-04	65-08-06	DST 206 10 <sup>3</sup> m <sup>3</sup> /d
Socony Mobil WM Blackie YT No. 1 M-59	M-59-66-00-137-00	Potential Gas Well	Gas Discovery	Permian	Conglom-eratic Sandstone	63-12-11	64-03-27	DST 79 10 <sup>3</sup> m <sup>3</sup> /d
WM Chance YT No. 1 M-08	M-08-60-10-137-30	Potential Gas or Oil Well	Gas & Oil Discovery	Cretaceous Carbon-iferous Hart River	Sandstone Conglom-eratic Sandstone	59-05-30	60-05-25	142 10 <sup>3</sup> m <sup>3</sup> /d 0.5 m <sup>3</sup> /d

**11. Peel Plateau — shows of hydrocarbons have been observed.**

**12. Old Crow Basin — no wells have been drilled to date in this basin.**

**13. Whitehorse Plain — no wells have been drilled to date in this basin.**

## Report of the Reserves Committee of the Canadian Petroleum Association — 1980

A slight decline in the natural gas supply and an increase in the decline of conventional crude oil reserves were reported in the 1980 report of the Canadian Petroleum Association Reserves Committee. Its compilation of the remaining reserves is shown in Table 2.

Remaining established reserves of conventional crude oil decreased to 1 154 million m<sup>3</sup>, a 12.7 per cent decline from 1979.

Remaining established reserves of marketable natural gas decreased to 2 491 864 million m<sup>3</sup>, a decrease of 0.2 per cent from 1979 reserves.

**Table 2**  
Canadian Petroleum Association Estimate of Reserve

Liquid Hydrocarbons  
Remaining Established Reserves North of 60° and Total for Canada  
Thousand Cubic Metres

Regions	Remaining Reserves 79-12-31	1980 Net Production	Remaining Reserves at 80-12-31	Net Change <sup>1</sup> in Reserves during 1980
<b>Crude Oil</b>				
Mainland Territories (S. of 68°N)	21 148	155	21 009	– 139
Canada Total Crude Oil	1 082 004	74 529	951 228	– 130 776
<b>Pentanes Plus</b>				
Mainland Territories (S. of 68°N)	—	—	195	195
Mackenzie Delta-Beaufort Sea	8 302	—	8 302	—
Canada Total Pentanes Plus	93 492	5 298	92 813	– 679
<b>Propane, Butane &amp; Ethane</b>				
Mainland Territories (S. of 68°N)	—	—	1 960	1 960
Canada Total Propane, Butane & Ethane	113 546	7 805	110 333	– 3 213
Canada Total Liquid Hydrocarbons	1 289 042	87 632	1 154 374	– 134 668

1. Changes in reserves are due to production, extensions, discoveries, and to revisions to calculated reserves.



**Marketable Natural Gas**

**Remaining Established Reserves North of 60° and Total for Canada**

Million Cubic Metres at 101.325 kPa and 15°C

Regions	Remaining Reserves 79-12-31	1980 Net Production	Remaining Reserves at 80-12-31	Net Change <sup>1</sup> in Reserves during 1980
<b>Marketable Natural Gas</b>				
Mainland Territories (S. of 68°N)	16 211	294	15 102	- 1 109
Mackenzie Delta-Beaufort Sea	184 123	—	184 123	—
Arctic Islands	397 619	—	380 551	- 17 068
Canada Total — Marketable Natural Gas	2 496 057	70 041	2 491 864	- 4 193

1. Changes in reserves are due to production, extensions, discoveries, and to revisions to calculated reserves.

## Summary of Oil and Natural Gas Resources

The Department of Energy, Mines and Resources has estimated the likelihood of existence of oil and gas resources in the various region of Canada. These estimates are reproduced in Table 3 and are based on data available to the end of 1975. New data on western Canada is now available in a report released in January 1980.

**Table 3**  
Summary of Oil and Natural Gas Resources — 1975\*

(Remaining Reserves, Discovered Resources and Undiscovered Potential)

Region	Likelihood of Existence		
	“50/50		
	“High”	Chance”	“Low”
	90%	50%	10%
	Proba- bility	Proba- bility	Proba- bility
Oil Resources (billions of barrels)			
Atlantic Shelf South	1.2	1.9	3.0
Labrador-East			
Newfoundland Shelf	1.7	2.6	4.5
Northern Stable			
Platform Basins	0.01	0.06	3.2
St. Lawrence Lowlands	0.04	0.09	0.2
Western Canada**	10.9	11.7	13.5
Mainland Territories	0.3	0.5	1.0
Mackenzie Delta-			
Beaufort Sea	4.3	6.9	12.0
Sverdrup Basin	1.1	2.0	4.0
Arctic Fold Belts	0.5	1.8	4.3
Total Canada (Accessible Regions)	25.0	30.0	43.0

Region	Gas Resources (trillions of cubic feet)		
Atlantic Shelf South	8.6	13.2	20.0
Labrador-East			
Newfoundland Shelf	18.0	26.7	45.0
Northern Stable			
Platform Basins	0.4	2.3	12.0
St. Lawrence Lowlands	0.7	1.4	3.2
Western Canada**	89.0	97.0	107.0
Mainland Territories	6.0	9.7	20.0
Mackenzie Delta-			
Beaufort Sea	39.0	60.0	99.0
Sverdrup Basin	21.0	40.0	80.0
Arctic Fold Belts	2.9	11.0	26.0
Total Canada (Accessible Regions)	229	227	378

Note: These columns do not total arithmetically to the Canada totals because individual curves must be summed using a statistical technique described elsewhere in the source report.

\* Extracted from Oil and Natural Gas Resources of Canada, 1976, Report EP-77-1, Department of Energy, Mines and Resources.

\*\*New estimate available. See GSC Open File Report 672. January 1980.

Oil and gas land activities during 1980 were carried out under authority of the Canada Oil and Gas Land Regulations. Although no proposals for exploration agreements were sought from the public during the year, five exploration agreements were concluded covering about 11 million hectares in Baffin Bay and Davis Strait. These blocks were selected by Petro-Canada under preferential rights contained in the 1977 amendments to the Regulations. An additional agreement was also negotiated for a single grid in Davis Strait and, at year-end, negotiations were proceeding with Petro-Canada and others towards conclusion of exploration agreements regarding several other prospects on the Mainland and in the Arctic Islands.

Although the total area of land holdings showed a decrease of about 8 per cent from 1979, the area held under lease increased. Since the majority of the existing permits reached maturity during 1980, only about half of the area held under exploration rights remains in the form of permits in statutory terms. The remainder is comprised of special renewal permits granted under discretionary terms and conditions, and in exploration agreements. (See Table 4, Figures 2 and 3). Figure 4 shows the extent of land holdings at the end of December, 1980 compared to 1974. Several leases containing commitments to drill wells were granted in support of current and proposed drilling programs in the Southern Territories and the Beaufort Sea. Exploratory operations continue to be concentrated in the more costly and remote regions: the Arctic Islands and the Beaufort Sea. Most of the holdings in these areas are in the form of special renewal permits which bear annually escalating levels of work requirements designed to ensure an orderly assessment of Canada's potential for oil and gas reserves.

**Table 4**

Number of Issued Exploration Rights (including permits, special renewal permits, exploration agreements) and Leases, with areal extent, as of December 31, 1980.

Area	Exploratory Rights		Leases	
	No.	Area (ha)	No.	Area (ha)
N.W.T. Mainland	115	2 065 408	1 216	2 784 878
Yukon Mainland	45	590 202	188	265 974
Arctic Islands	657	12 397 699	173	513 522
Arctic Coast Marine	1 695	41 668 832	327	826 567
Total	2 512	56 722 141	1 904	4 390 941

The proposed *Canada Oil and Gas Act*, Bill C-48, further detailed in the following section of this report, will affect all oil and gas land holdings in the North. The existing permit and lease system will be replaced by a new system of grants. A relatively brief period will be provided for replacement of existing rights by those to be negotiated and granted under the new land management regime. Levels of ownership of oil and gas resources by Canadians will be prescribed as a condition for obtaining production licences as well as a qualifying condition for exploration incentives under the Petroleum Incentives Program. It is anticipated that industry land holdings in the North may be somewhat reduced in the short term by virtue of the proposed Act. However, the legislation and complementary regulations will remove the uncertainty that has inhibited regular disposals of new rights over the last several years and will lead to a more orderly assessment of resource potential in the North.



Figure 2  
**Area Held Under Oil and Gas Permit**  
 Yukon Territory and Northwest Territories

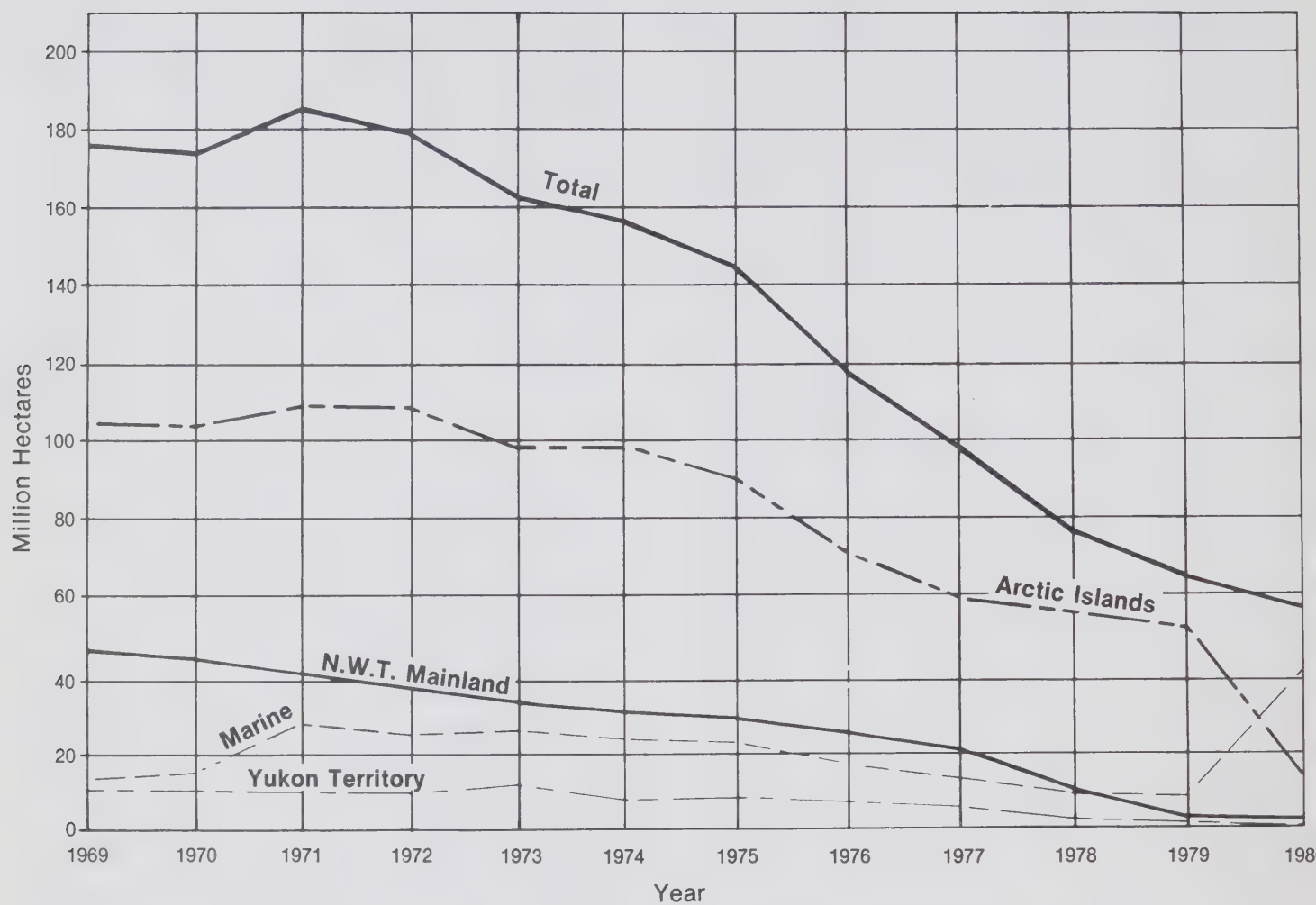
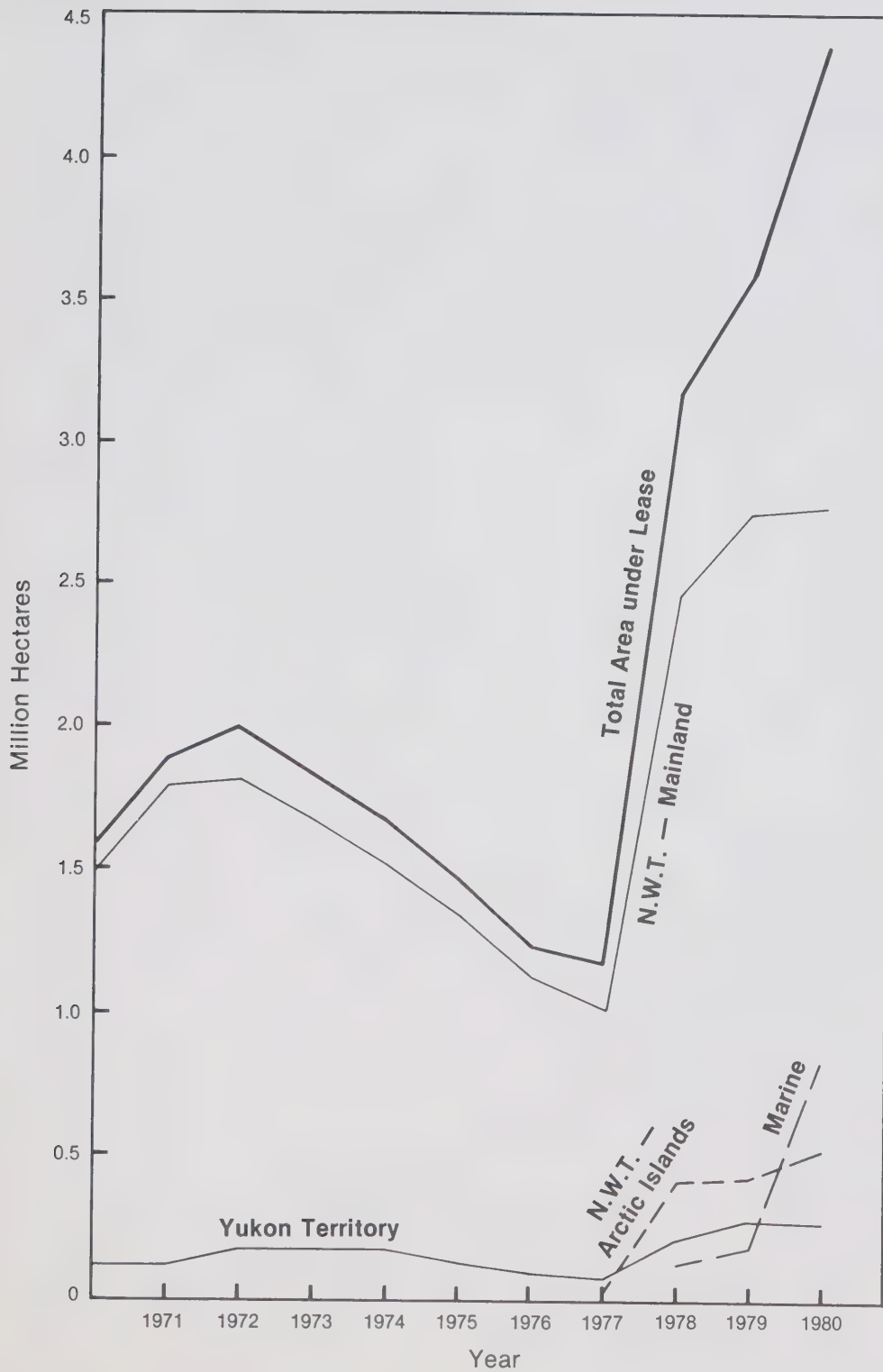
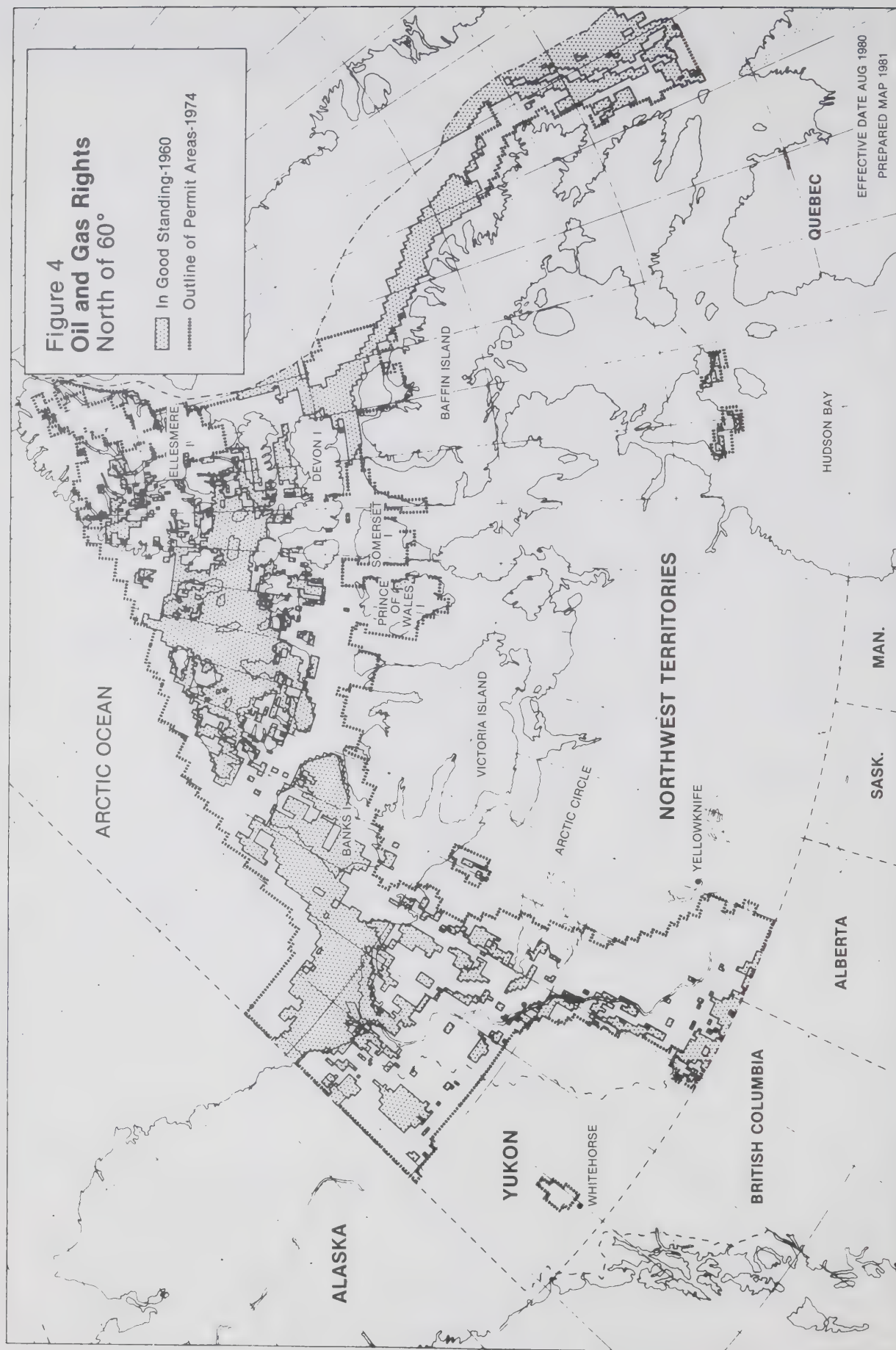


Figure 3  
**Area Under Lease by Year**  
 Yukon Territory and Northwest Territories



**Figure 4**  
**Oil and Gas Rights**  
**North of 60°**

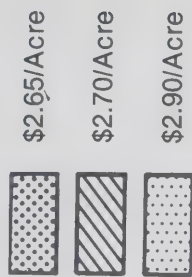
 In Good Standing-1960  
 Outline of Permit Areas-1974





Canada Lands are administered by the Department of Indian Affairs and Northern Development north of the heavy line, and by the Department of Energy, Mines and Resources south of the heavy line.

**Figure 5**  
**Permit Terms and Work**  
**Requirement Zones**  
**North of 60°**



Scale in miles



Alaska

Permit Term  
12 years

Permit Term  
10 years

Permit Term  
9 years

B.C.

Alta.

Sask.

Man.

# Acts and Regulations

## Canada Oil and Gas Act

Bill C-48, *the Canada Oil and Gas Act*, was tabled in Parliament on December 9, 1980. This legislation is one of the major elements of the government's National Energy Program announced at the same time as the Budget of October, 1980. Other elements included oil and gas taxation measures, proposals to increase resource ownership by Canadians and an incentive program for companies participating in exploration and development of oil and gas resources.

Bill C-48 sets out a comprehensive management regime for exploration, development and production of oil and gas in Canada's frontier areas. It will increase Canadian ownership of resources through the reservation of 25 per cent interest to the Crown in all rights to be granted under the Act. This interest may be assigned to Petro-Canada or some other designated Crown corporation, or may be offered to Canadian companies by way of public tender process. As a condition of a grant of a production licence, the Bill requires a minimum level of 50 per cent Canadian ownership of the resource. In addition to a basic royalty of 10 per cent on oil and gas produced, it also proposes a further royalty of 40 per cent of net profits. The Bill also will require the holders of existing rights to convert their holdings to exploration agreements or provisional leases within a relatively brief transitional period. In order to accelerate the pace of exploration and development of frontier resources, the replacement rights will bear considerably shorter terms and more stringent work requirements than those existing under the previous regime. As well, the Bill provides for increased Ministerial discretion to demand, as a condition of land tenure, provision of goods and services by Canadians and social benefits as well as other considerations relevant to concerns of Northerners. It also provides for the establishment of an Environmental Studies Revolving Fund to facilitate the exploration process in areas under the Minister's jurisdiction, and for ways and means of determining the extent of Canadian ownership of oil and gas.

## Canada Oil and Gas Land Regulations

Bill C-48 provides that the existing Regulations will continue until revoked or replaced by new regulations to be promulgated under the Act. Certain provisions of the existing regulations, particularly as to the forms of grants to be issued, will be replaced by specific provisions immediately upon enactment of the legislation. The preferential rights for Petro-Canada in the existing regulations regarding exploration agreements will be revoked. However, many of the existing regulatory provisions, including such matters as land divisions, methods and timing of applications, giving of notices, submission of reports and other information, etc. are likely to remain unchanged during the short term. New specific regulations will be required for such matters as eligible costs and investments for royalties, registration and filing of documents and other information, fees and service charges, operating agreements and arbitration of specific issues.

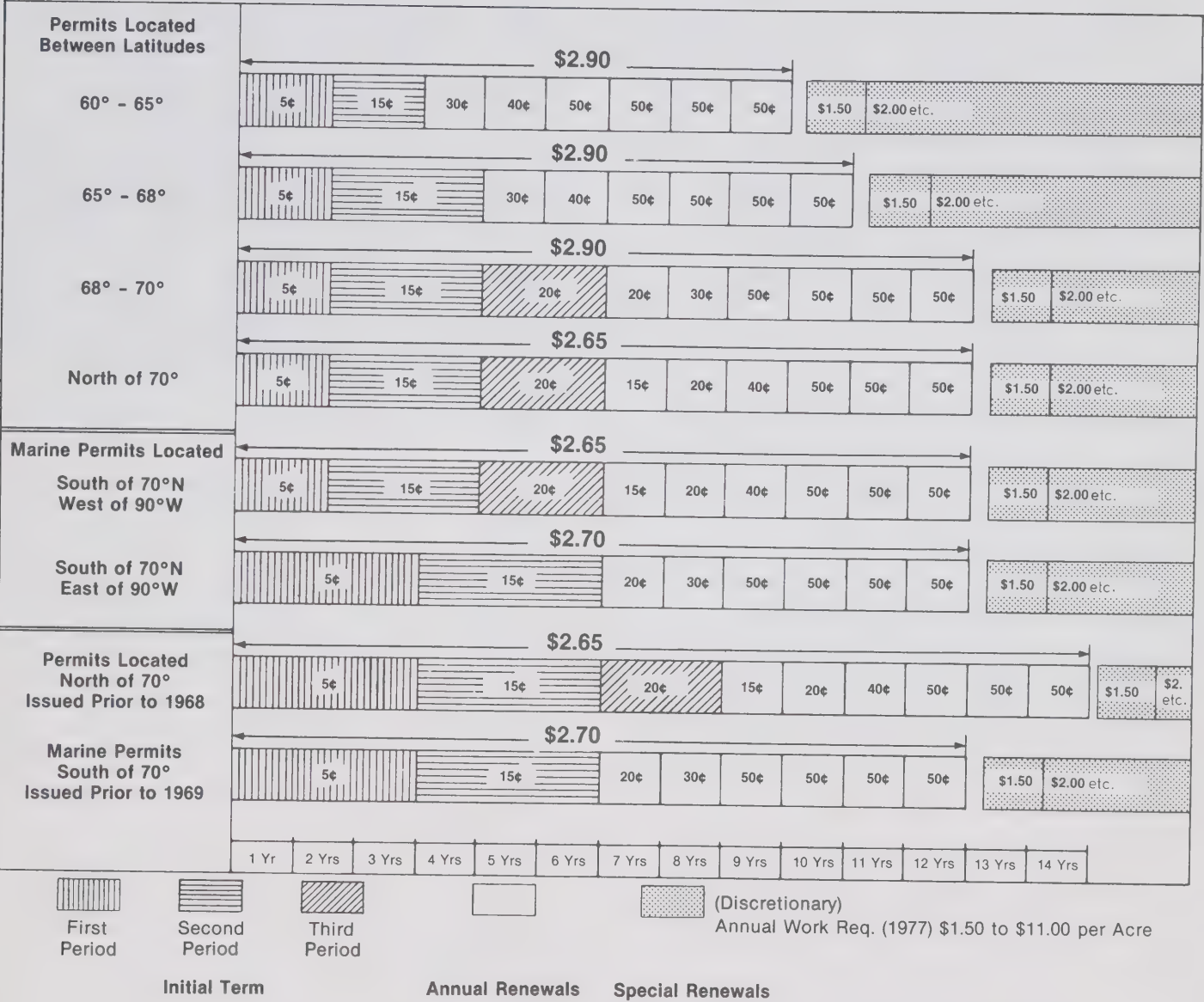
The terms for permits already issued under the existing *Canada Oil and Gas Land Regulations* are summarized in Figures 5 and 6. Figure 5 shows the permit term in years, including the renewals rented subsequent to the initial term and the total per acre\* minimum work requirements for each period of the permit life and entry into special renewal terms are illustrated in Figure 6. Figure 7 shows diagrammatically the flow of Canada oil and gas rights, through the various disposal channels under the present regulations.

---

\*Since relevant acts and regulations have not yet been changed the conversion to hectares could not be made.

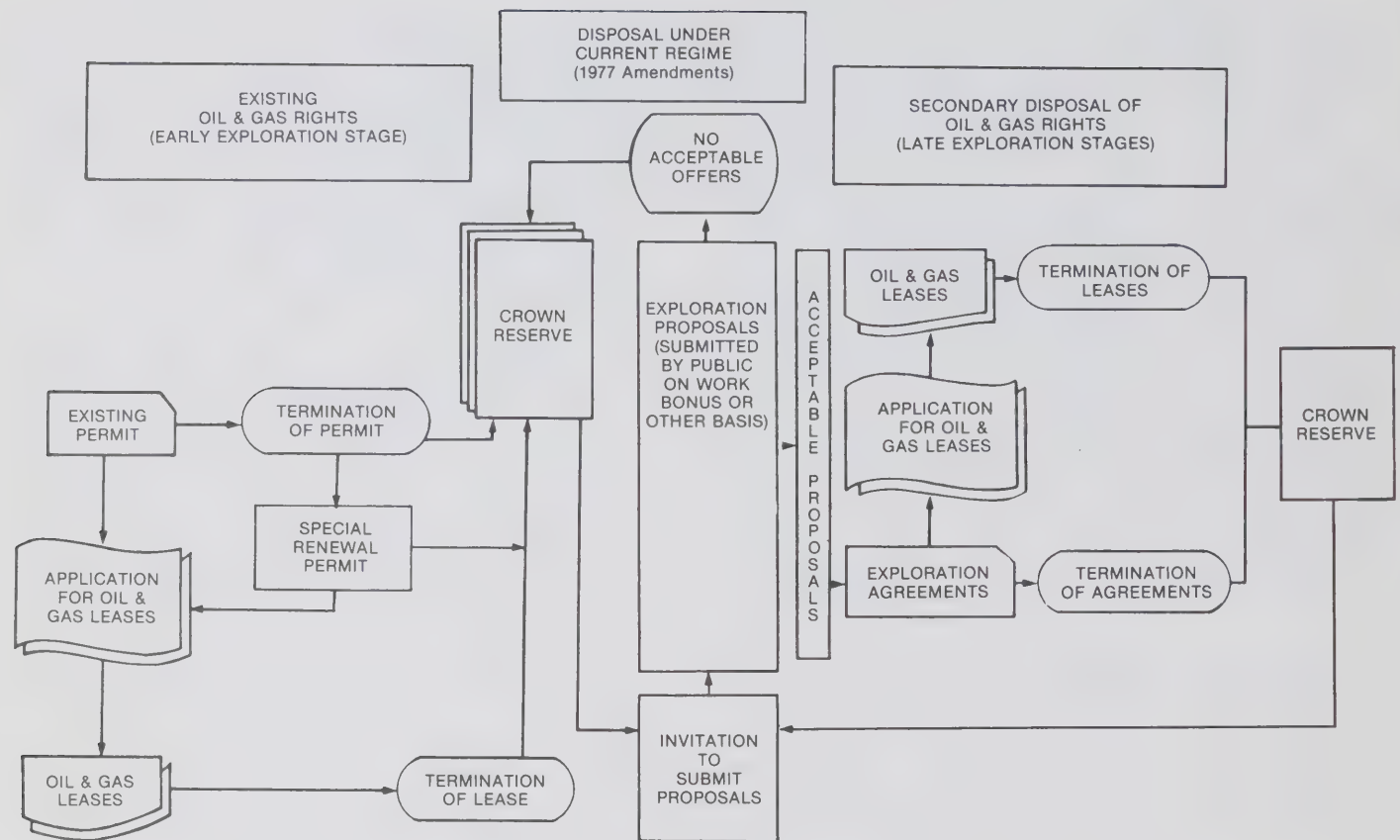


**Figure 6**  
**Permit Terms and Deposit Requirements**  
**Per Acre**  
**Yukon Territory and Northwest Territories**





**Figure 7**  
**Disposal of Oil and Gas Rights**



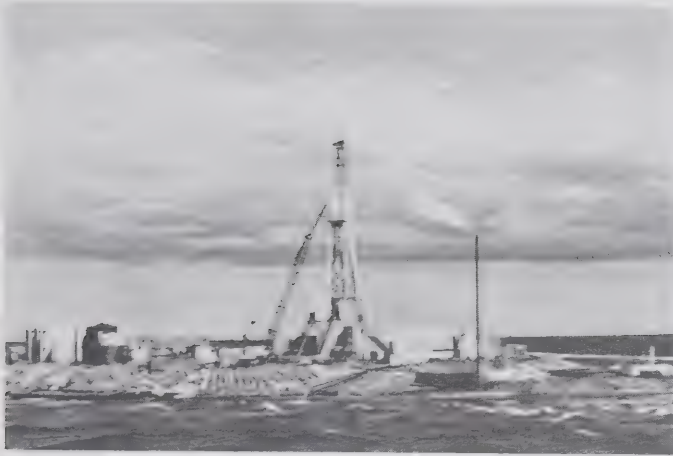


Photo 2  
Esso Issungnak 2-O-61 Artificial Island Well (Courtesy Esso Resources)

## Canada Oil and Gas Geophysical Regulations

A joint project was initiated by the departments of Indian Affairs and Northern Development and Energy, Mines and Resources to draft the *Canada Oil and Gas Geophysical Regulations* for promulgation under the *Canada Oil and Gas Production and Conservation Act*. Sections of the regulations will pertain to onshore and offshore geophysical operations on Canada Lands.

The primary intent of these regulations will be to ensure:

- the safety of personnel working on geophysical crews;
- the protection of the living resources of the onshore and marine areas to be surveyed;
- the quality and type of geophysical data submitted to the relevant resource organizations.

In 1980, the Legal Division of Energy, Mines and Resources prepared the final draft for submission to the Department of Justice.

## Canada Oil and Gas Pipeline Regulations

These regulations have been drafted over the past several years by staff of the departments of Indian Affairs and Northern Development and Energy, Mines and Resources, under the *Canada Oil and Gas Production and Conservation Act*. Subsequently, joint meetings with an industry task force were held in 1977 to discuss these regulations. The *Canada Oil and Gas Pipeline Regulations* have been submitted to the Legal Division of Energy, Mines and Resources for editing in preparation for promulgation.

## Canada Oil and Gas Production Regulations

The Canada Oil and Gas Production Regulations were redrafted by the staff of the two departments in 1979 and were submitted again to the industry task force in 1980 for review and comment.

## Canada Oil and Gas Drilling Regulations

A joint project was initiated by the departments of Indian Affairs and Northern Development and Energy, Mines and Resources to draft the *Canada Oil and Gas Drilling Regulations* under the *Canada Oil and Gas Production and Conservation Act*. In 1978 the regulations pertaining to the drilling of both onshore and offshore wells were completed and reviewed with industry. The regulations were promulgated on January 22, 1979.



Revenues from northern operations for the calendar year 1980 approximated \$11.1 million (Table 5 and Figure 8), about the same as in 1979.

Photo 3  
Esso Issungnak 2-O-61 Artificial Island Well (Courtesy Esso Resources)

Total revenues from all sources for the fiscal year 1980-1981 approximated \$12 million (Table 6 and Figure 9) up about \$2 million from the previous fiscal year.

Figure 10 shows the annual value of work bonus for oil and gas work bonus blocks, permits and exploration agreements. The cumulative value of work bonus to the end of 1980 was about \$59 million, an increase of \$100 000 from 1978, the result of the issuance of a single exploration agreement to Petro Canada in 1979.

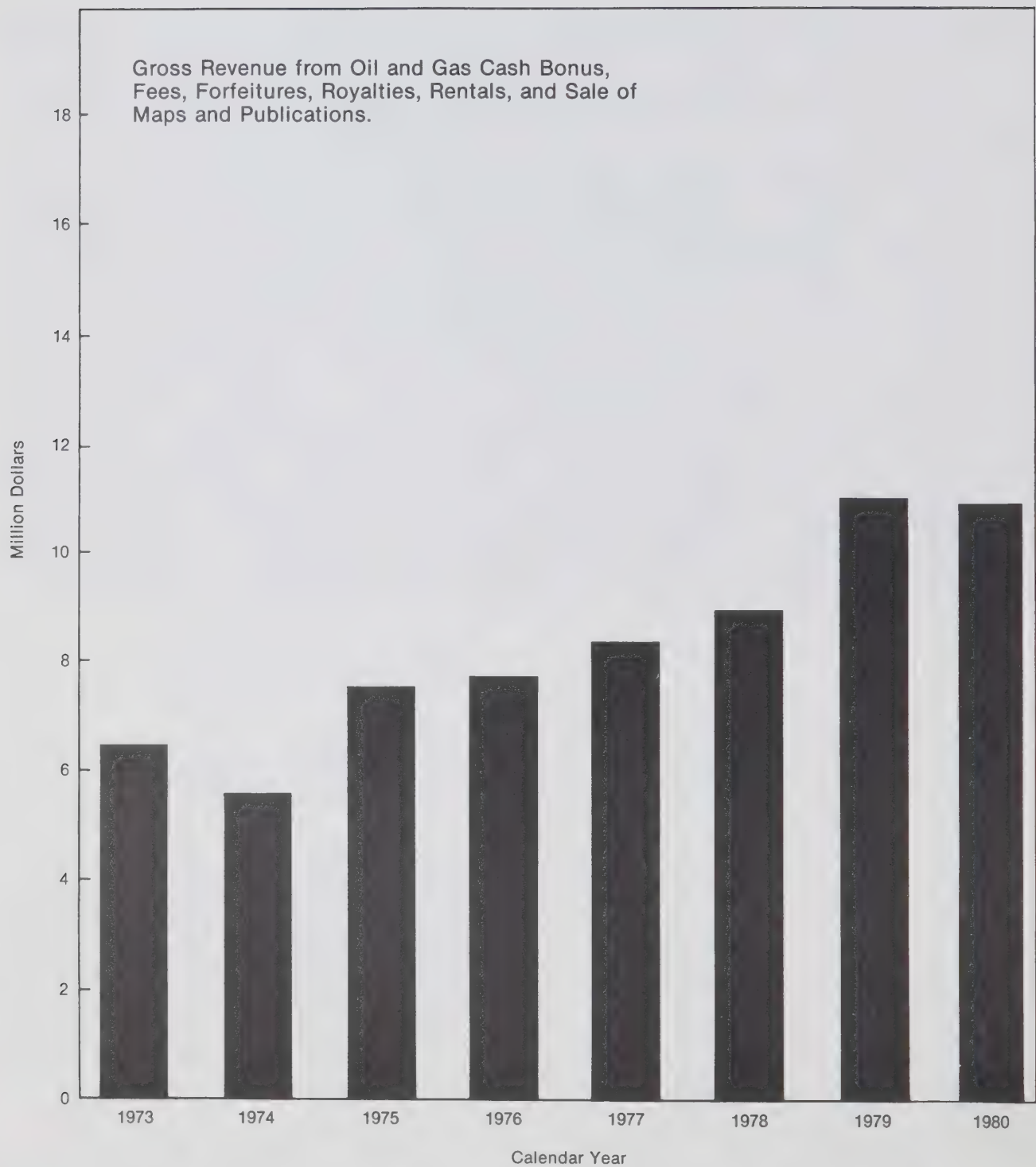


**Table 5**  
Gross Revenue, Oil and Gas (Calendar Year) 1974 to 1980

Year	Licence Fee	Permit Fee	Transfer Fee	Lease Fee	Rentals	Royalties	Forfeitures	Cash Bonus	Misc.	Total
<b>Northwest Territories</b>										
1974	\$ 3 625.00	\$ 73 220.00	\$ 44 900.00	\$ 4 140.00	\$ 3 812 555.16	\$ 1 186 071.90	\$ 47 550.09	—	\$ 2 865.00	\$ 5 174 927.15
1975	2 750.00	4 000.00	10 005.00	3 970.00	3 684 559.54	3 425 965.83	172 517.93	—	1 353.53	7 305 121.83
1976	2 425.00	—	14 635.00	4 670.00	2 675 065.79	4 688 996.80	219 104.46	—	5 015.75	7 609 912.80
1977	2 600.00	—	12 635.00	6 320.00	3 266 775.28	4 778 130.10	105 853.49	—	3 506.10	8 175 819.97
1978	2 100.00	—	25 550.00	2 600.00	3 999 061.10	4 337 465.61	270 561.83	—	4 798.55	8 642 137.09
1979	475.00	1 500.00 <sup>1</sup>	18 105.00	1 718.50	5 564 311.51	5 136 151.06	40 300.60	—	31.00	10 762 592.67
1980	475.00	250.00	42 830.00	3 510.00	5 788 993.49	4 886 629.26	—	—	—	10 728 689.75
Total	14 450.00	78 970.00	168 660.00	26 928.50	28 791 321.87	28 439 410.56	855 886.40	—	17 569.93	58 393 199.56
<b>Yukon Territory</b>										
1974	—	—	75.00	180.00	409 060.00	24 364.11	—	—	—	433 679.11
1975	—	—	3 610.00	90.00	204 281.25	177 504.68	—	—	—	385 485.93
1976	—	—	45.00	50.00	104 353.00	144 461.20	—	—	—	248 909.20
1977	—	—	1 075.00	110.00	155 065.25	64 318.13	—	—	—	220 568.38
1978	—	—	290.00	320.00	337 081.90	6 710.07	1 845.62	—	—	346 247.59
1979	—	—	80.00	200.00	320 195.25	23 089.77	—	—	—	343 565.02
1980	—	—	1 100.00	20.00	396 871.03	58 526.48	—	—	—	456 517.51
Total	—	—	6 275.00	970.00	1 926 907.68	498 974.44	1 845.62	—	—	2 434 972.74
<b>Total Revenues</b>										
1974	\$ 5 608 606.26									
1975	7 690 607.76									
1976	7 858 822.00									
1977	8 396 388.35									
1978	8 988 384.68									
1979	11 106 157.69									
1980	11 179 205.26									
Total	58 849 716.77									

<sup>1</sup>Exploration Agreement Fee

**Figure 8**  
**Calendar Year Revenue**  
Yukon Territory and Northwest Territories  
(Table 5)



**Table 6**  
Gross Revenue, Oil and Gas (Fiscal Year)

Year	Licence Fee	Permit Fee	Transfer Fee	Lease Fee	Rentals	Royalties	Forfeitures	Cash Bonus	Misc.	Total
<b>Northwest Territories</b>										
1973-74	\$ 4 100.00	\$ 189 500.00	\$ 19 440.00	\$ 2 170.00	\$ 4 808 931.18	\$ 729 372.07	\$ 188 606.71	—	\$ 5 022.14	\$ 5 947 142.10
1974-75	3 125.00	31 220.00	41 680.00	4 810.00	3 899 447.35	1 283 911.85	147 713.98	—	2 290.53	5 414 198.71
1975-76	1 320.00	—	8 955.00	4 040.00	3 718 493.34	4 352 171.61	165 716.01	—	1 438.75	8 252 134.71
1976-77	3 450.00	—	14 870.00	3 960.00	4 343 465.73	4 672 663.83	142 315.07	—	5 138.65	9 185 863.28
1977-78	825.00	—	15 670.00	6 490.00	3 488 769.99	4 624 080.66	105 853.49	—	2 811.20	8 244 499.74
1978-79	1 125.00	—	25 620.00	2 730.00	5 196 829.46	4 231 446.53	285 579.70	—	3 947.15	9 747 277.84
1979-80	400.00	1 500.00 <sup>1</sup>	16 130.00	1 228.50	4 998 883.82	4 491 795.94	40 300.60	—	22.00	9 550 260.86
1980-81	425.00	250.00 <sup>1</sup>	44 295.00	6 220.00	6 413 973.26	5 187 176.06	—	—	78.96	11 652 418.28
Total	14 770.00	222 470.00	186 660.00	31 648.50	36 868 794.13	29 572 617.95	1 076 085.56	—	20 749.38	67 993 995.52
<b>Yukon Territory</b>										
1973-74	—	3 500.00	—	—	357 644.38	14 073.52	—	—	—	375 217.90
1974-75	—	—	75.00	180.00	400 627.00	55 064.20	—	—	—	455 946.20
1975-76	—	—	3 635.00	90.00	184 243.25	195 397.97	—	—	—	383 366.22
1976-77	—	—	1 095.00	80.00	130 779.75	122 435.71	—	—	—	254 390.46
1977-78	—	—	—	140.00	230 641.15	29 216.00	1 845.62	—	—	261 842.77
1978-79	—	—	230.00	420.00	299 291.90	4 514.52	—	—	—	304 456.42
1979-80	—	—	115.00	40.00	392 012.28	94 428.24	—	—	—	486 595.52
1980-81	—	—	2 865.00	50.00	349 327.00	18 325.85	—	—	—	370 567.85
Total	—	3 500.00	8 015.00	1 000.00	2 344 566.71	533 456.01	1 845.62	—	—	2 892 383.34
<b>Total Revenues</b>										
1973-74	\$ 6 322 360.00									
1974-75	5 870 144.91									
1975-76	8 635 500.93									
1976-77	9 440 253.74									
1977-78	8 506 342.51									
1978-79	10 051 734.26									
1979-80	10 036 856.38									
1980-81	12 022 986.13									
Total	70 886 178.86									

<sup>1</sup>Exploration Agreement Fee



Figure 9  
**Fiscal Year Revenue**  
Yukon Territory and Northwest Territories  
(Table 6)

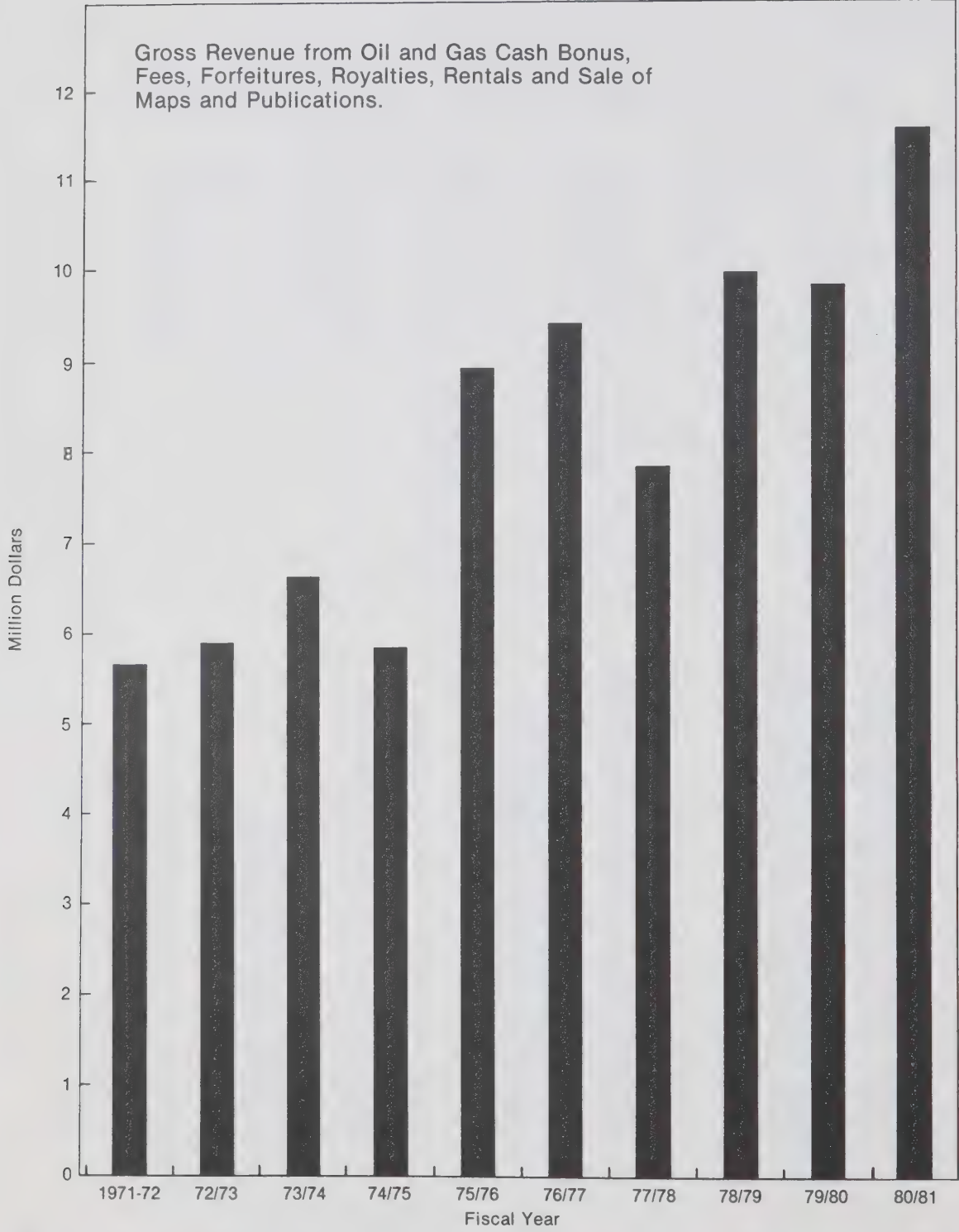
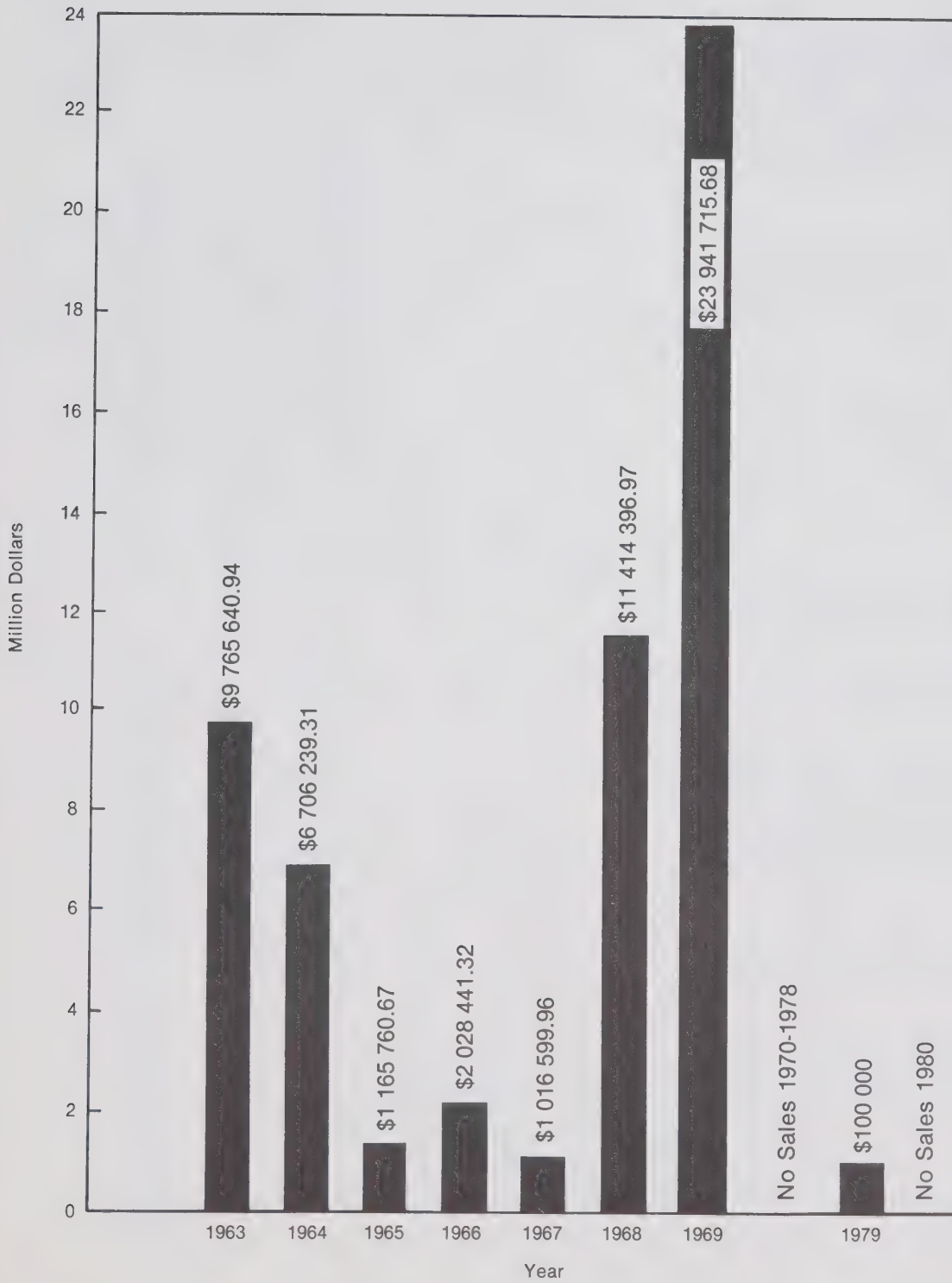


Figure 10  
Value of Work Bonus Tenders  
Yukon Territory and Northwest Territories



# Exploration, Drilling Operations and Discoveries

## Exploration

### Geological and Geophysical Surveys

As in previous years geological field work was at minimum levels. Petro-Canada and Esso conducted small programs totalling 1.8 crew months on the Northwest Territories mainland and Panarctic carried out a half-crew month program in the Arctic Islands.

### Land Seismic Surveys

There was a marked increase in land seismic surveys in 1980 compared to 1979. Crew-months increased from 5.1 to 17.1 and line-kilometres from 1 251 in 1979 to 4 345 in 1980.

On the mainland Northwest Territories, Esso and Petro-Canada conducted programs totalling 968 line-km. In the Mackenzie Delta, Esso conducted a 1 944-km program, and in the Arctic islands, Chevron and Panarctic conducted programs totalling 1 433 km.

### Marine Seismic Surveys

Marine seismic surveys declined in 1980 as compared with 1979, with only 8 651 km being run.

Esso Resources conducted a 100 km. river seismic program in the Norman Wells area.

In the Beaufort Sea, Gulf Resources, Dome Petroleum, Esso Resources, Texaco Canada, Western Decalta Petroleum, Canadian Superior and Geophysical Services Inc. carried out programs totalling 8 396 km. These programs included 3-D seismic programs by Esso at Adgo and Dome at Kopanoar.

Esso and Aquitaine conducted small programs of only 60 and 95 km., respectively, in Baffin Bay — Davis Strait.

Table 7 shows the exploration survey statistics for all areas north of 60° and the comparison of the 1980 activities with those of previous years.

## Drilling

Drilling activity increased in 1980. Nineteen wells, including ten exploratory wells, seven development wells and one service well, with a total depth of 42 325 m, were drilled in the Yukon and Northwest Territories.

### Offshore

**Western Arctic** — Dome/Canmar, for the fifth consecutive year, drilled in the Beaufort Sea. The Tarsiut A-25 gas discovery of 1979 was re-entered this season and further tests revealed a significant recovery of oil and gas. Koakoak O-22, Orvilruk O-03, and an offset to the Kopanoar I-44 well, were deepened and suspended approaching final depths. They will be tested in 1981. Kenalook J-94 and Kilannak A-77 were also spudded and will be re-entered next season. Multi-year ice floes encroaching on the drillsites in mid-September curtailed the 1980 season. However, Dome was engaged in the building of artificial islands at Tarsiut and Kaglulik locations and these, complemented by its floating drilling operations, should extend its drilling season in 1981.

Esso drilled at the artificial island location Issungnak O-61 and a significant recovery of oil and gas was recorded. With Gulf as a partner, Esso will delineate the Issungnak structure in 1981.

**Eastern Arctic** — Aquitaine drilled the Hekja O-71 well, initiated in 1979, to final depth in the waters of Baffin Bay-Davis Strait. Testing of the well indicated a gas discovery at an intermediate depth. Future operations in the Eastern Arctic are uncertain at this time.



**Figure 11**  
**Exploration Activity**  
Yukon Territory and Northwest Territories

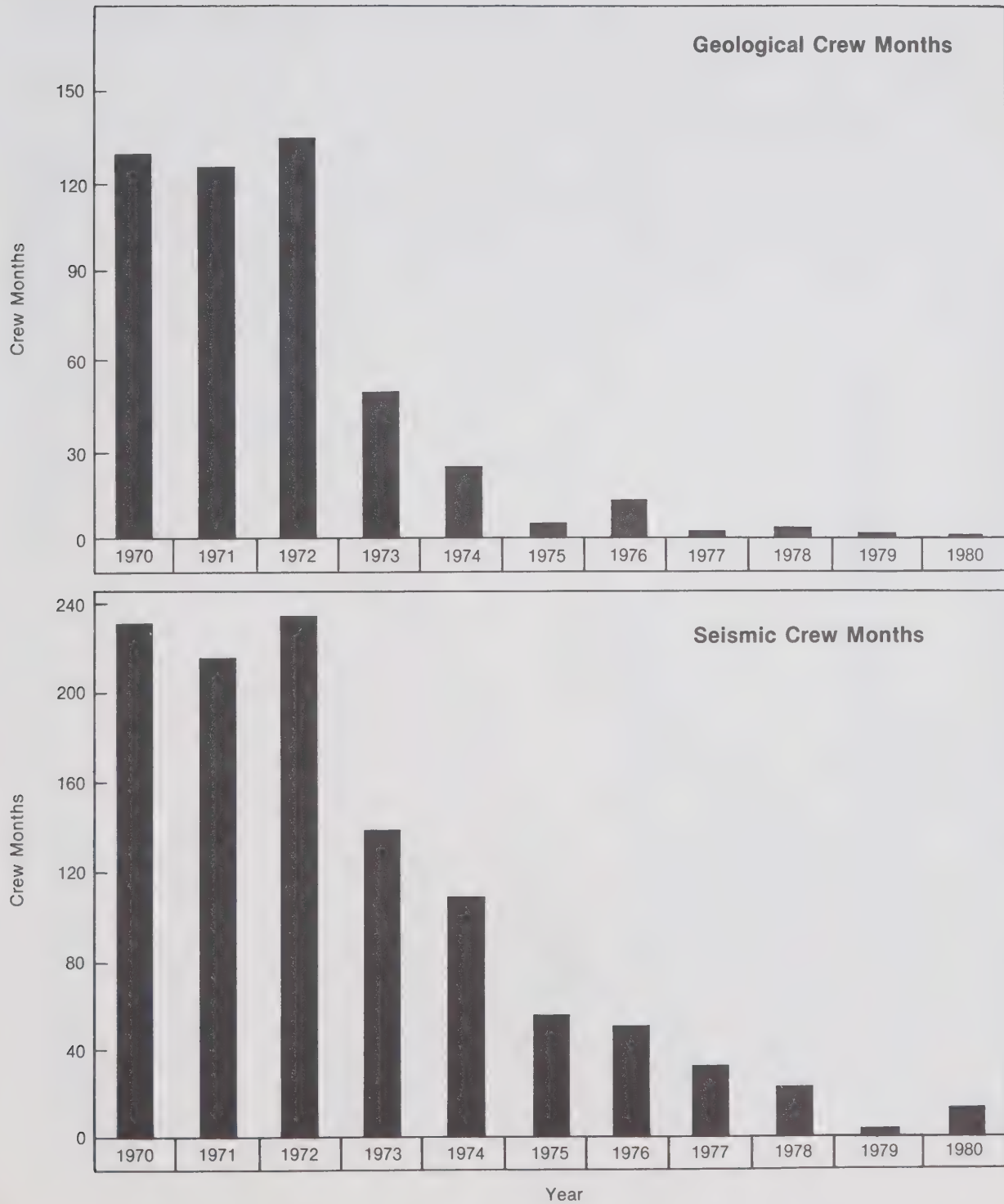
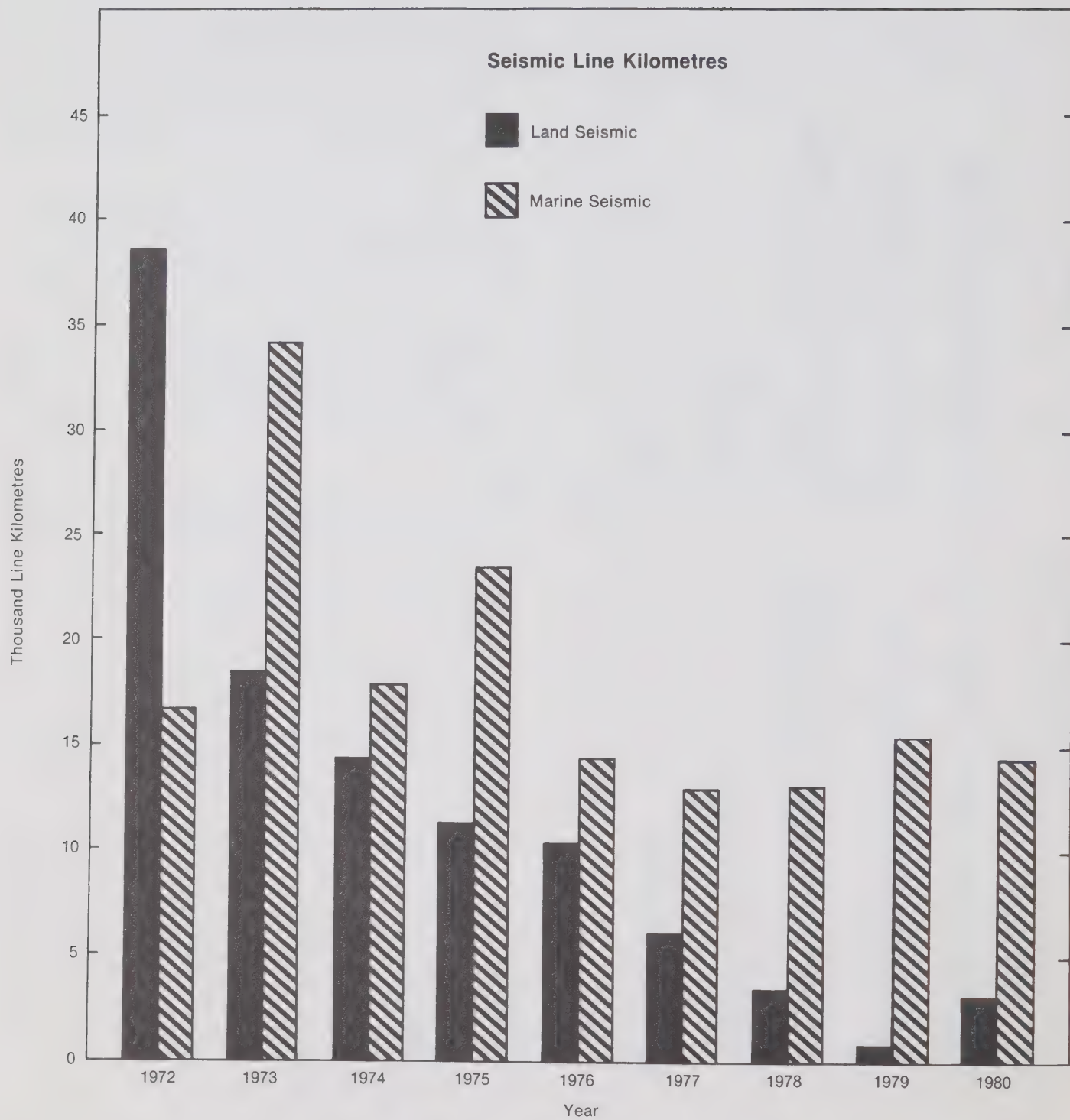


Figure 12  
**Exploration Activity**  
Yukon Territory and Northwest Territories



**Table 7**  
1973-1980 Exploration Survey Statistics

	Yukon Territory	N.W.T. Mainland	Mackenzie Delta	Beaufort Sea	Arctic Islands and Surrounding Water	Baffin Bay-Davis Strait	Total
<b>Geological Crew Months</b>							
1973	3.0	9.0	0	0	37.0	1.0	50.0
1974	3.5	1.5	4.5	0	15.5	0	25.0
1975	0	0	0	0	3.5	1.0	4.5
1976	4.0	1.5	1	0	5.5	1.0	13.1
1977	0	0	1.5	0	1.0	0	2.5
1978	0	0	3.0	0	1.0	0	4.0
1979	0	0	0	0	1.0	0	1.0
1980	0	1.8	0	0	0.3	0	2.1
<b>Land Seismic Crew Months</b>							
1973	10.0	25.0	42.0	4.0	58.0	0	139.0
1974	3.0	27.0	41.0	2.0	37.0	0	110.0
1975	0	14.5	10.5	0.1	32.0	0	57.1
1976	0	3.0	18.5	1.0	29.5	0	52.0
1977	0	0.5	10.0	0	21.5	0	32.0
1978	0	2.0	8.0	0	7.5	0	17.5
1979	0	0	0	0	5.0	0	5.0
1980	0	6.0	3.5	0	7.6	0	17.1
<b>Seismic Line-Kilometres</b>							
<b>Land</b>							
1973	984	1 855	5 593	757	8 939	0	18 127
1974	195	3 111	5 200	121	5 520	0	14 147
1975	0	2 531	1 093	14	7 449	0	11 089
1976	0	5 435	3 353	124	6 499	0	10 519
1977	0	77	811.9	0	4 843.3	0	5 732.5
1978	0	143	671	0	2 446	0	3 260
1979	0	5.4	0	0	780.2	0	785.6
1980	0	968	1 944	0	1 433	0	4 345
<b>Marine</b>							
1973	0	29	0	7 412	8 061	17 834	33 337
1974	0	0	0	2 776	6 697	8 167	17 641
1975	0	0	0	4 135	5 380	14 638	24 153
1976	0	0	69	4 515	2 151	7 879	14 614
1977	0	0	0	4 668.7	3 410.2	4 129.6	12 208.5
1978	0	0	0	5 747	0	6 896	12 643
1979	0	123	0	8 056	0	7 110	15 289
1980	0	100	0	8 396	0	155	8 651

\*A number of very small programs, too limited to record, were carried out in various areas in 1979.



## Arctic Islands

Panarctic continued its exploration of the High Arctic, drilling from offshore ice platforms at three locations. The testing of the wells resulted in three discoveries; gas at Whitefish 2H-63, oil and gas at Char G-07, and oil at Balaena D-58. Panarctic intends to drill at three more ice platform locations in the winter of 1980-1981.

In addition to the offshore drilling program, Dome and Panarctic drilled Wallis A-73 and Vesey A-27 respectively. Both wells were dry and abandoned.

## Mainland

Esso Resources Canada Limited continued to delineate the oil field at Norman Wells, drilling from an island in the Mackenzie River at Mackenzie River No. 4, and three more wells from the Mainland.

Westcoast Silt Lake G-62 and Texaco Bovie Lake M-78 were drilled and abandoned in the southern Mainland. Paramount discovered some gas in the Liard D-29 well in the vicinity of their Cameron Hills gas prospect, which is to be further appraised in 1981.

## Mackenzie Delta

Esso drilled and abandoned Mayogiak M-16.

## Yukon

Columbia Gas continued its development of the Kotaneelee gas field with the drilling of one well, Kotaneelee Y.T. I-48.

## Discoveries

Eight discoveries or extensions to existing fields were made in 1980. In the Arctic Islands, Panarctic Oils reported an oil discovery at their Balaena D-58 well; oil and gas at the Char G-07 well; and gas at the Whitefish 2H-63 well. The former two wells discovered new pools while the Whitefish 2H-63 was an extension to the 1979 gas discovery Whitefish H-63 well.

In the Davis Strait, Aquitaine completed drilling and testing their Hekja O-71 well. Results of a significant gas discovery were announced by the operator.

The Delta-Beaufort Sea area recorded two significant discoveries; Esso Resources' Issungnak O-61 discovered both gas and oil while Dome tested oil and gas in the Tarsiut A-25 well.

In the Southern Territories, Paramount tested gas at their Liard D-29 and Cameron J-62 wells; in the Yukon, Columbia completed their Kotaneelee I-48 gas well.

**Table 8**

Wells Abandoned or Completed in 1980.

Nineteen wells were drilled to total depth in 1980. The total depth drilled was 42 325 m. (D & A indicates dry and abandoned, WDW indicates water disposal well.)

Name of Well	Spudded	Completed	Status	Total Depth (metres)
<b>Northwest Territories — Arctic Islands</b>				
Aquit et al Hekja O-71 O-71-62-20-62-45	79-07-29	80-10-07	Abandoned Gas Well	4 566
Dome et al Wallis A-73 A-73-78-00-102-00	80-05-16	80-10-27	D & A	2 827
Panarctic et al Balaena D-58 D-58-77-40-100-00	80-02-06	80-04-27	Abandoned Oil Well	1 730
Panarctic et al Char G-07 G-07-77-40-99-30	80-02-14	80-04-22	Abandoned Gas and Oil Well	2 179
Panarctic AIEG Whitefish 2H-63 H-63-77-20-106-30	79-12-03	80-05-15	Abandoned Gas Well	3 003
Panarctic BP AIEG Vesey A-27 A-27-77-00-109-00	80-06-08	80-09-09	D & A	2 922

Name of Well	Spudded	Completed	Status	Total Depth (metres)
<b>Northwest Territories — Mainland</b>				
Esso Mackenzie River(4) D-27 D-27-65-20-126-45	80-02-07	80-02-28	Abandoned Oil Well	555
Esso Norman Wells (44X)B-48 B-48-65-20-126-45	80-01-20	80-03-21	Completed Water Injection Well	655
Esso Norman Wells (45X)P-37 P-37-65-20-126-45	80-03-27	80-04-16	Oil Well Water	607
Esso Norman Wells (46X)P-37 P-37-65-20-126-45	80-04-20	80-07-06	Oil Well	931
Paramount HB et al Cameron B-13 B-13-60-10-117-00	80-03-14	80-04-04	D & A	911
Paramount HB et al Cameron J-62 J-62-60-10-117-15	80-02-07	80-03-11	Completed Gas Well	1 605
Paramount et al Liard D-29 D-29-60-30-123-30	79-01-28	80-07-21	Suspended Gas Well	3 120
Texaco Shell Bovie Lake M-78 M-78-60-20-122-45	80-01-20	80-03-28	D & A	3 082
Westcoast et al Silt Lake G-62 G-62-60-10-119-00	80-01-27	80-02-26	D & A	1 877
<b>Northwest Territories — Delta — Beaufort Sea</b>				
Esso Gulf Issungnak O-61 O-61-70-10-134-00	80-02-06	80-07-08	Abandoned Oil & Gas Well	3 583
Dome et al Kopanoar I-44 I-44-70-30-135-00	80-07-10	80-08-01	D & A	649
Esso Mayogiak M-16 M-16-69-30-132-45	80-01-24	80-04-10	D & A	3 093
<b>Yukon Territory</b>				
Columbia et al Kotaneelee YT I-48 I-48-60-10-124-00	79-04-18	80-04-08	Gas Well	4 430

## 1981 Forecast

General activity will be similar to 1980. The main activity areas will be the Arctic Islands, and the Mackenzie Delta-Beaufort Sea.

It is expected that exploration in the Arctic Islands will continue at the same pace as in 1980. Four or five wells will be drilled, including at least three from artificial ice islands. Seismic surveys will be generally restricted to inter-island, on-ice programs.

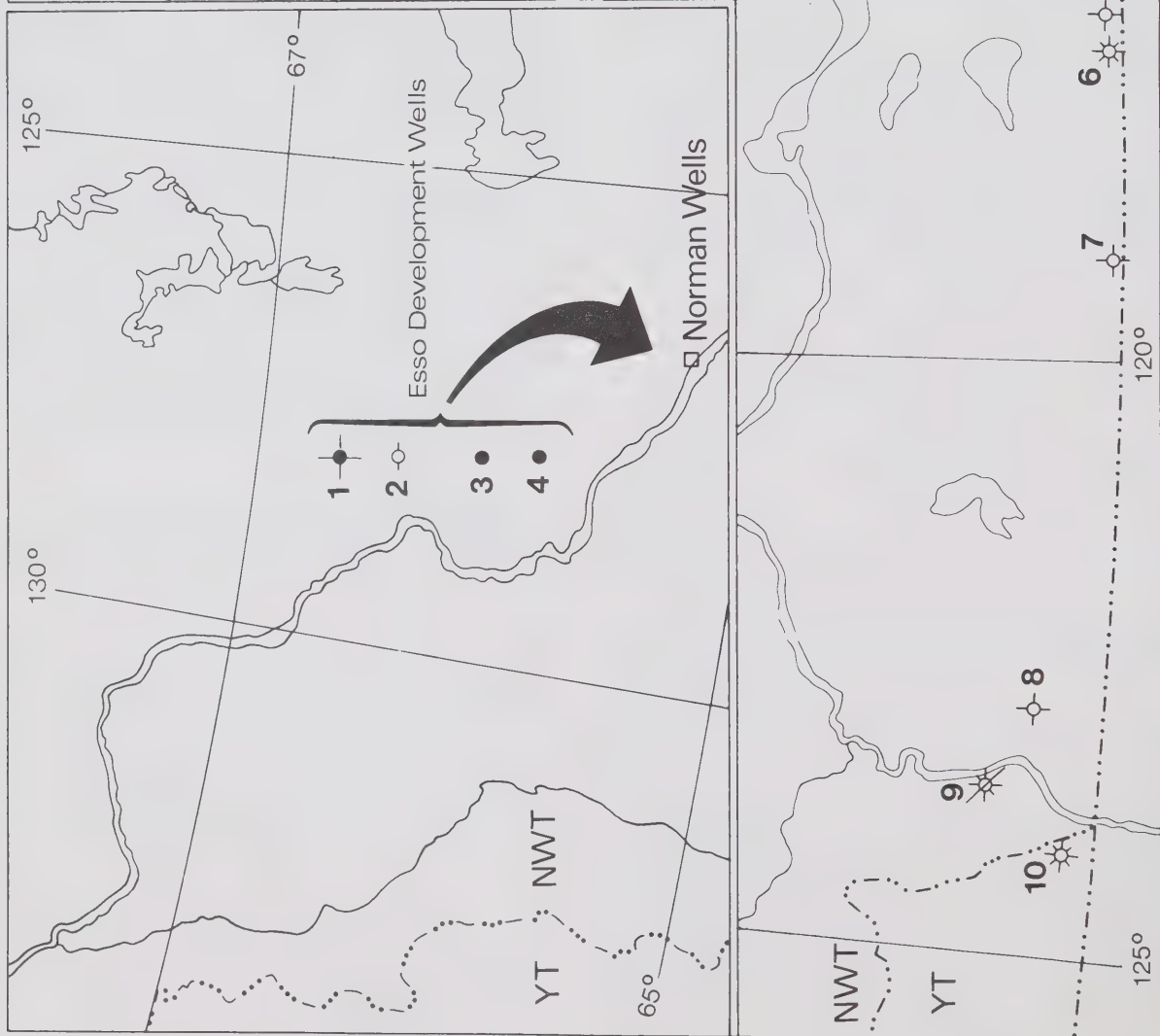
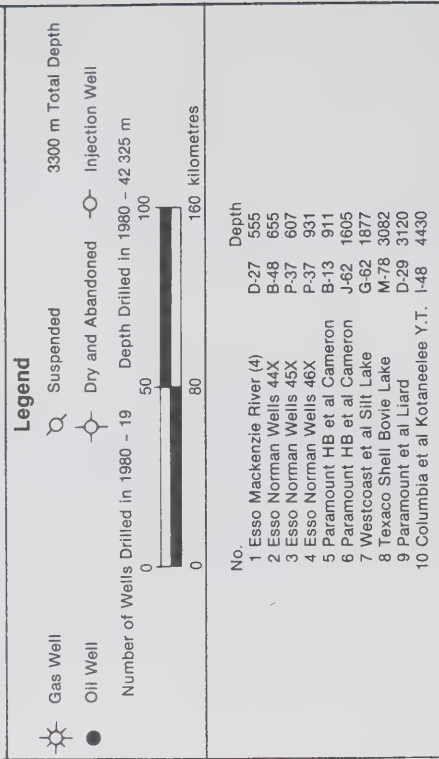
Dome Petroleum, using three of its four drillships, expects to complete and test at least five wells in 1981. In addition, Dome is engaged in building artificial islands at the Tarsiut and Kaglulik well locations. Dome's fourth drillship will be loaned to Gulf to drill the North Issungnak well location.

Esso expects to drill at least one well in 1981 in the Mackenzie Delta and at least one in the near-shore delta areas.

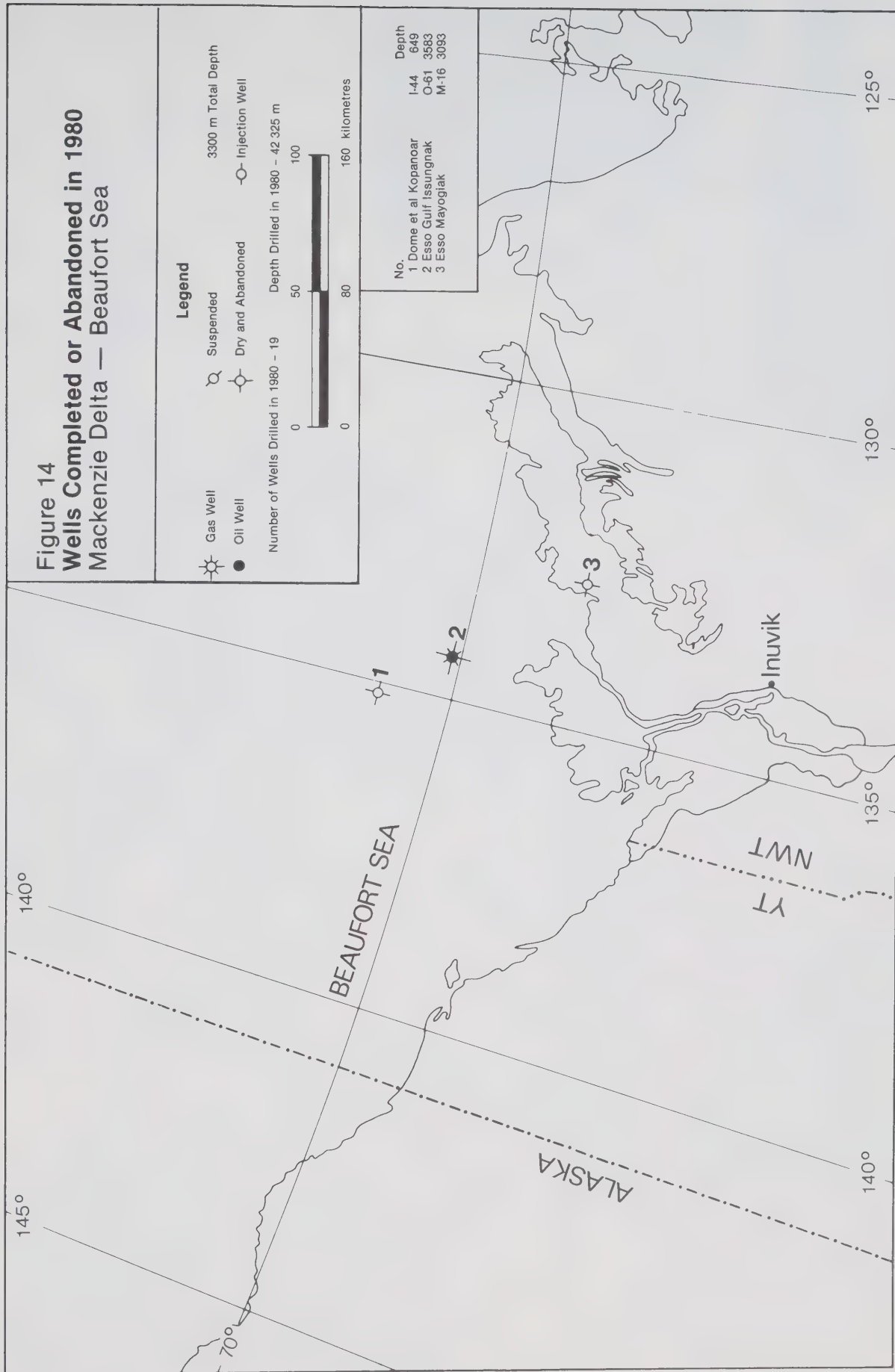
In March, 1980, Esso submitted a plan to initiate a secondary recovery scheme for the Norman Wells field. This will involve drilling of injection and production wells on the mainland, on the two islands and from artificial islands that are to be constructed in the Mackenzie River.

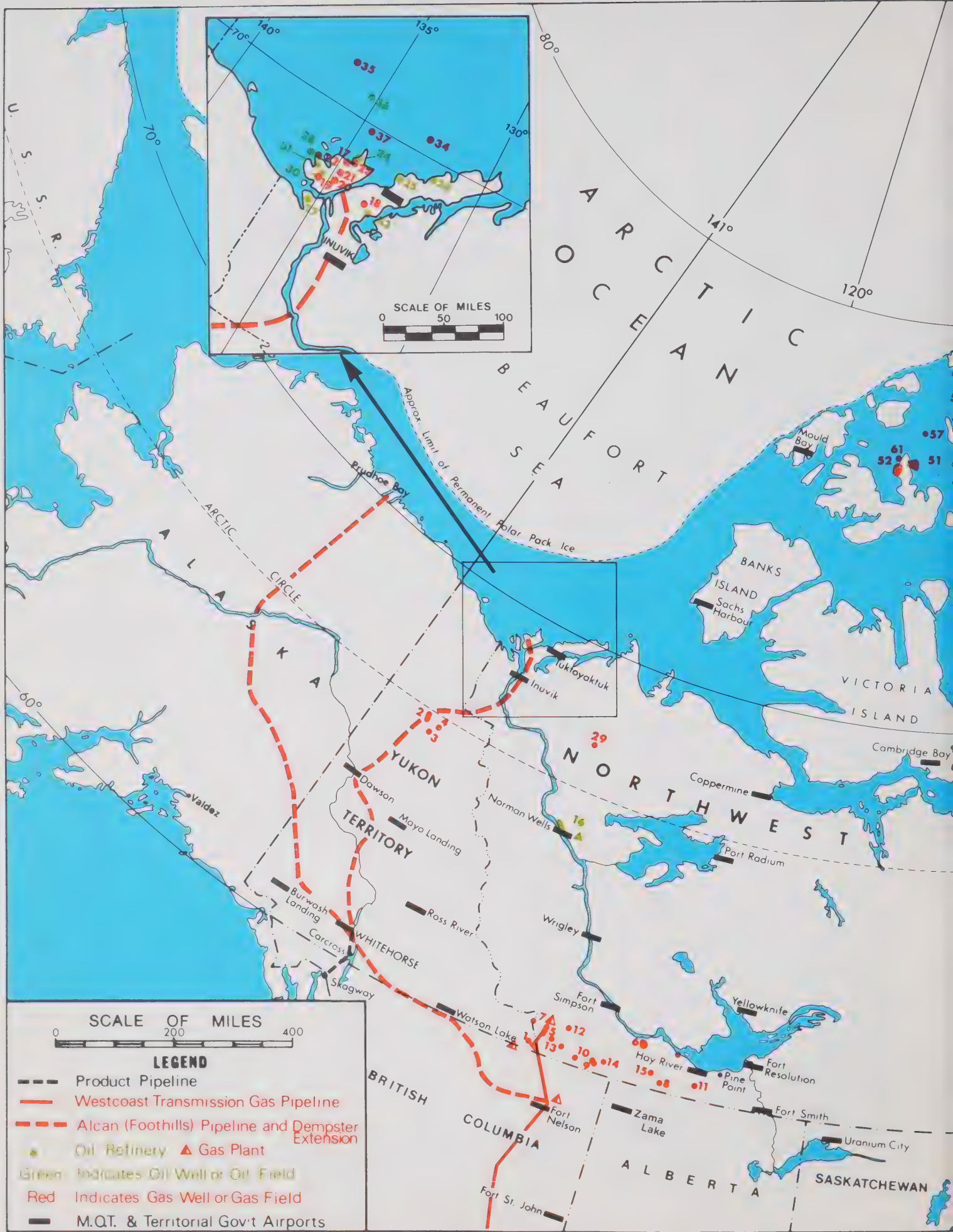
In the Southern Territories, several operators will continue to drill shallow and medium depth wells to search for hydrocarbons in Devonian carbonates.

**Figure 13**  
**Wells Completed or Abandoned in 1980**  
**Southern Northwest Territories and**  
**Yukon Territory**











# Oil and Gas Fields and Discoveries



## Yukon Territory

- 1 Kotaneelee Gas Field
- 2 Chance Gas Field
- 3 Socony Mobil et al Blackie No. 1
- 4 Socony Mobil et al Birch Y.T. B-34

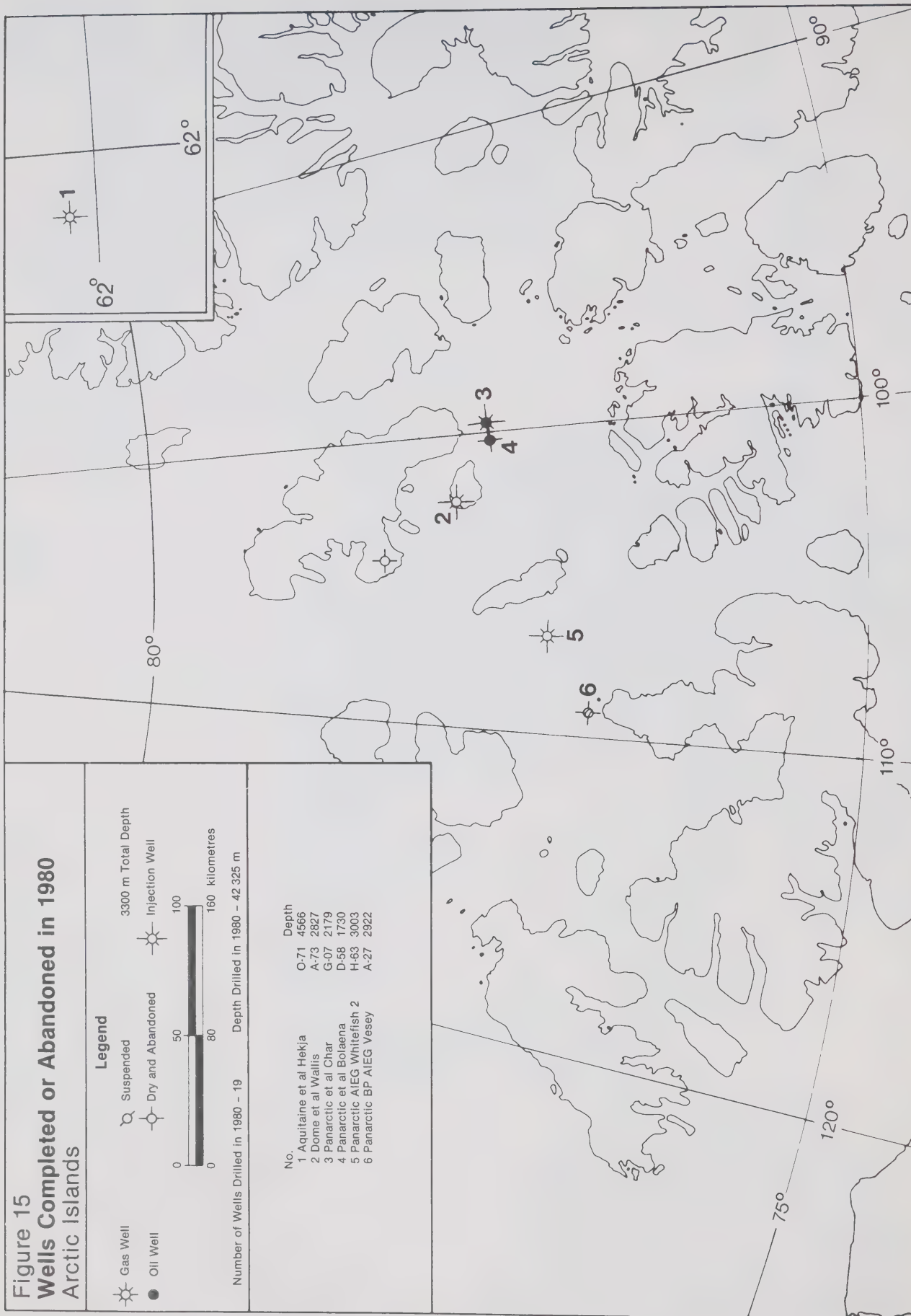
## Northwest Territories

- 5 Pointed Mountain Gas Field
- 6 Rabbit Lake Gas Field
- 7 C.P.O.G. et al LaBiche F-08
- 8 H.B. Cameron Hill A-05
- 9 S. Island River Gas Field
- 10 Home Signal Celibeta H-78
- 11 Shell H.B. Grumbler G-63
- 12 Sun Netla C-07
- 13 Texaco Bovie Lake J-72
- 14 Union Pan Am. Trainer Lake C-39
- 15 Pacific Amoco Tathlina N-18
- 16 Normal Wells Oil Field
- 17 Taglu Gas Field
- 18 Parsons Gas Field
- 19 Gulf Imperial Shell Titalik K-26
- 20 Gulf Imperial Shell Reindeer F-36
- 21 Gulf Mobil Ya Ya P-53 and A-28 Gas Pools
- 22 Shell Niglintgak H-30 and M-19
- 23 Imperial I.O.E. Mallik L-38
- 24 Imperial Ivik J-26
- 25 I.O.E. Mayogiak J-17
- 26 I.O.E. Atkinson H-25
- 27 Shell Kugpik O-13
- 28 Imp. Adgo F-28
- 29 Ashland Tedji Lake F-24
- 30 Kumak Oil and Gas Field
- 31 Garry Oil and Gas Field
- 32 Imp. Netserk F-40
- 33 Gulf Mobil Kamik D-48
- 34 Dome Hunt Nektoralik K-59
- 35 Dome Gulf et al Ukalerk C-50
- 36 Hunt Dome Kopanoar M-13
- 37 Imp. Isserk E-27
- 38 Paramount et al Cameron J-62
- 39 Paramount et al Liard D-29
- 40 Esso et al Issungnak O-61

## Arctic Islands

- 51 Drake Point Gas Field
- 52 Hecla Gas Field
- 53 King Christian Gas Field
- 54 Panarctic Tenneco et al Kristoffer Bay B-06
- 55 Dome Arctic Ventures Wallis K-62
- 56 Thor Gas Field
- 57 Panarctic Whitefish
- 58 Dome Sutherland O-23
- 59 Panarctic Bent Horn N-72, A-02
- 60 Panarctic Jackson Bay G-16A
- 61 Panarctic Roche Point
- 62 Aquitaine Hekja O-71
- 63 Panarctic et al Balaena D-58
- 64 Panarctic et al Char G-07





**Figure 16**  
**Wells Drilled**  
Yukon Territory and Northwest Territories

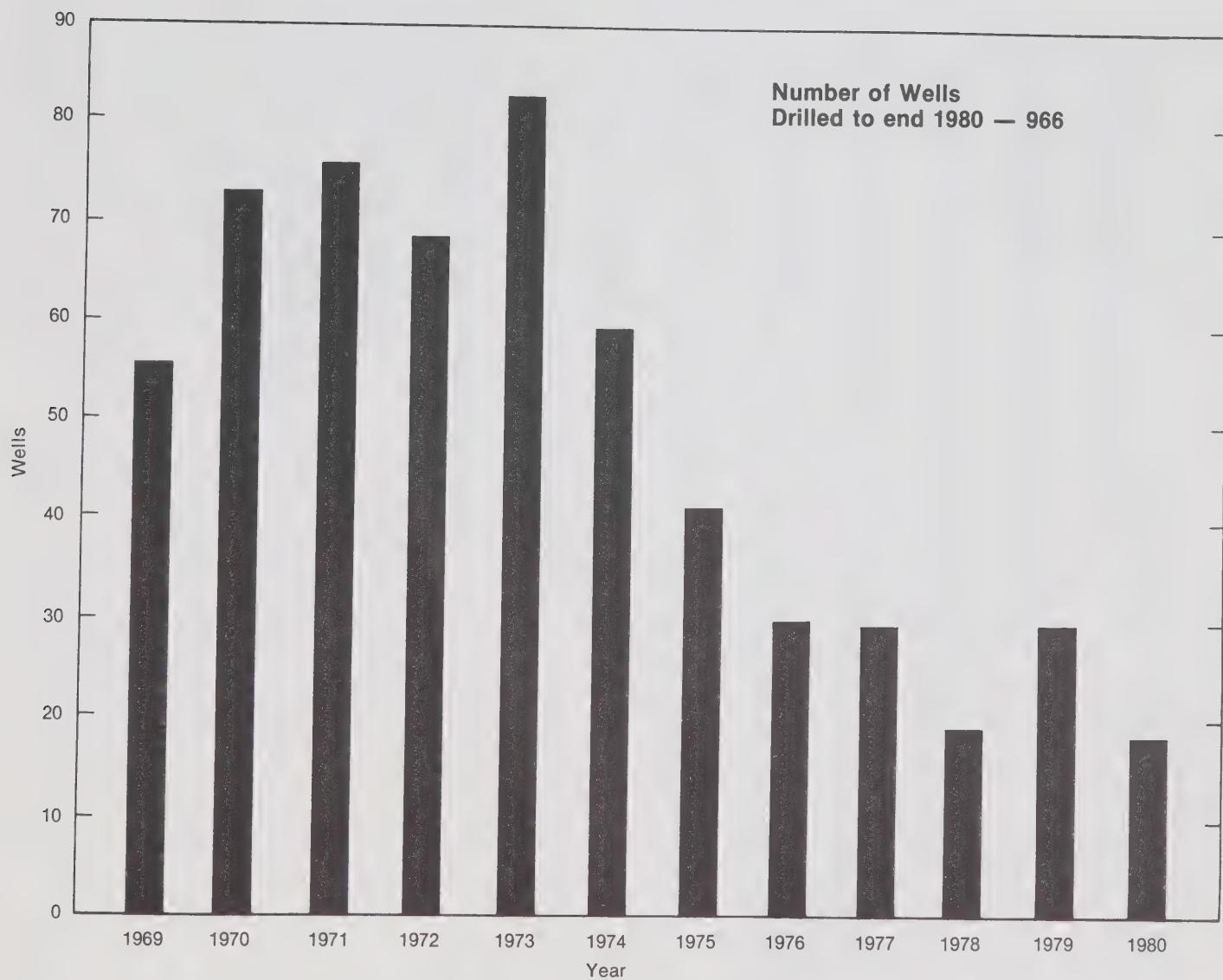
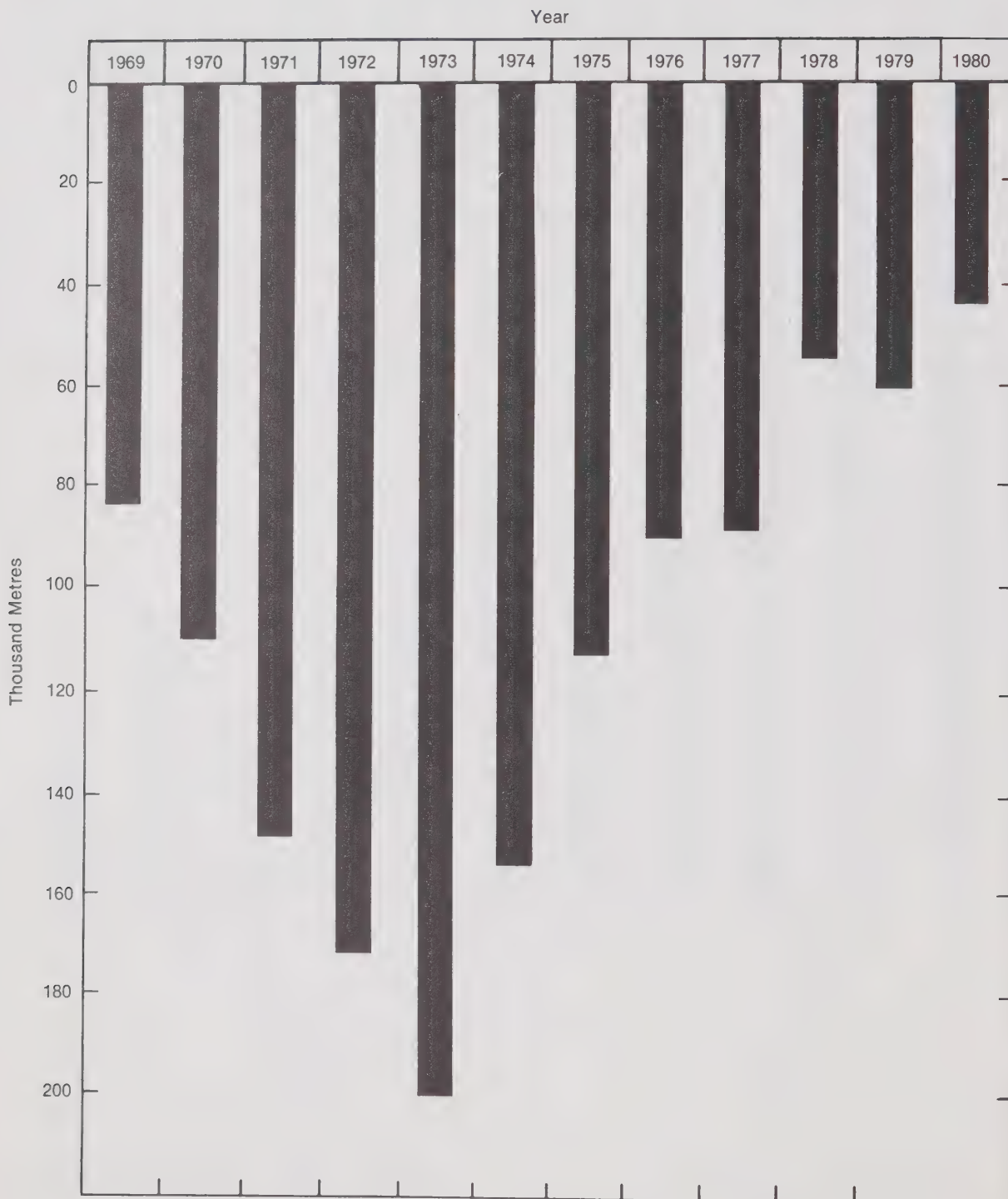


Figure 17  
**Depth Drilled**  
Yukon Territory and Northwest Territories





# Net Cash Expenditures by Industry in 1980

Total expenditures, according to information compiled by the Department of Indian Affairs and Northern Development, Statistics Canada and the Canadian Petroleum Association are shown in Tables 9 and 10 and Figure 18. Gross industry expenditures north of 60° increased over those of 1979 by approximately \$160 million to reach a total of \$618 million. Exploratory and development drilling expenditures increased to \$444 million (up

14 per cent), while total geological and geophysical expenditures increased to \$40 million, a 60 per cent increase from 1979. For the 1980 period expenditures on lands administered by Energy, Mines and Resources were \$380 million, an increase of \$145 million from the previous year.

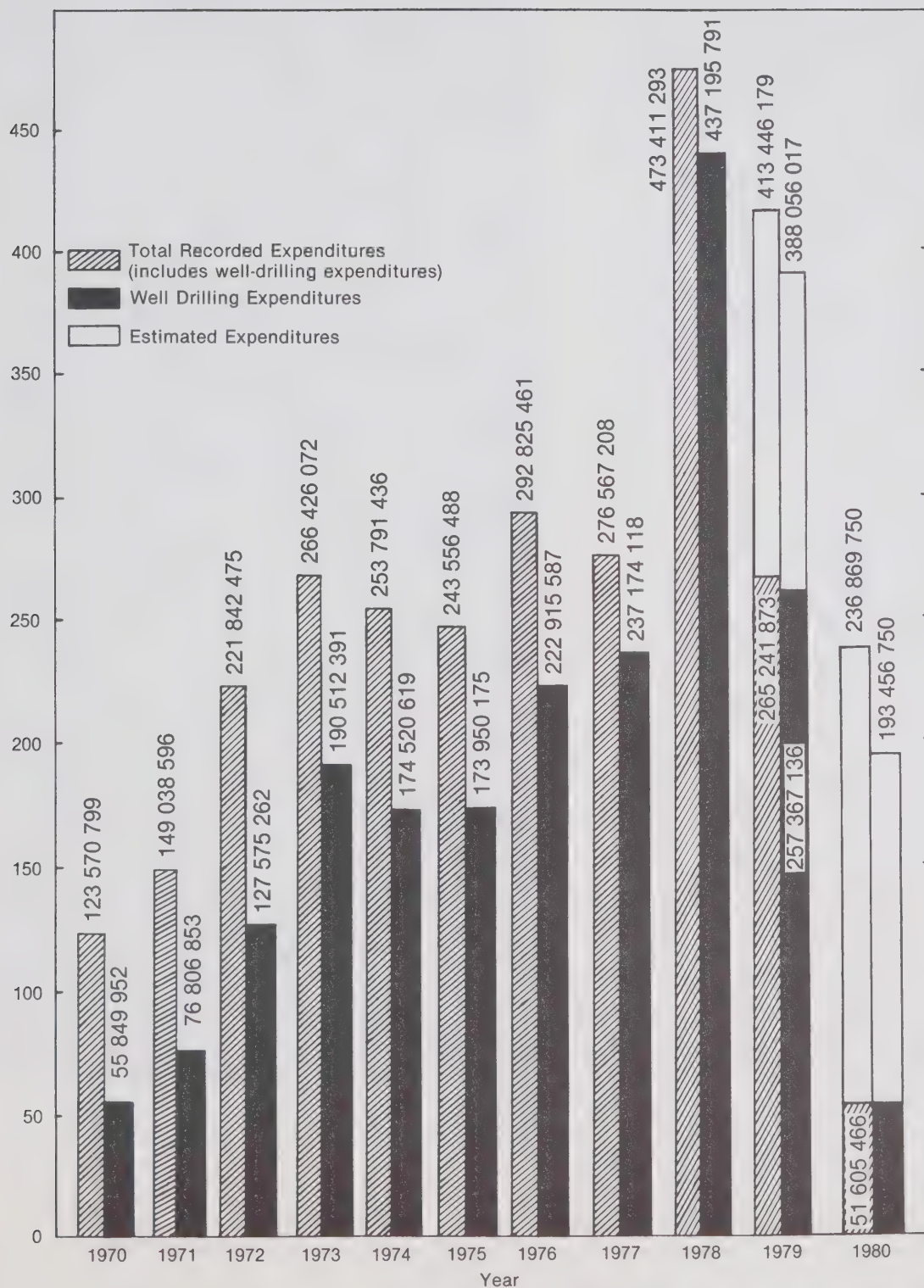
**Table 9**  
Net Cash Expenditures 1979 (Final)  
(in thousands of dollars)

	East Coast	Offshore Hudson Bay	West Coast	Yukon, N.W.T. and Arctic Islands	Canada
<b>Geological and geophysical expenditures</b>					
(a) Seismic crew expenses	9 495	—	—	11 125	236 854
(b) All other geological and geophysical expenses	11 911	2	—	14 265	250 587
<b>Land and lease acquisition and retention</b>					
(a) Permit fees and acquisition costs	1 134	—	—	20	885 108
(b) Non-producing acreage retention costs	555	45	—	5 925	94 313
(c) Producing lease and surface rentals	—	—	—	117	34 861
Exploratory drilling	204 150	—	—	373 453	1 371 561
Development drilling	—	—	—	14 603	617 126
<b>Other capital expenditures</b>					
(a) Tangible well and lease equipment	1 944	—	—	6 591	410 568
(b) Pipelines and related facilities	—	—	—	—	63 019
(c) Secondary recovery and pressure maintenance projects	—	—	—	14 683	71 159
(d) Natural gas processing plants	—	—	—	—	213 815
(e) All other capital expenditures	5 655	—	—	5 359	64 858
Field, well and pipeline operations	38	—	—	7 023	712 898
Natural gas plant operations	—	—	—	1 171	294 846
<b>Other operating expenditures</b>					
(a) Taxes (excluding income taxes)	279	—	—	172	121 948
(b) Royalties	—	—	—	5 136	3 389 150
(c) Interest expense	—	—	—	309	192 670
(d) Other	401	—	—	226	157 445
<b>Total</b>	<b>235 562</b>	<b>47</b>	<b>—</b>	<b>460 178</b>	<b>9 182 786</b>

**Table 10**  
**Net Cash Expenditures 1980 (Preliminary)**  
(in thousands of dollars)

	East Coast	Offshore Hudson Bay	West Coast	Yukon, N.W.T. and Arctic Islands	Canada
<b>Geological and geophysical expenditures</b>					
(a) Seismic crew expenses	34 228	—	144	26 713	390 990
(b) All other geological and geophysical expenses	23 446	—	—	14 812	323 895
<b>Land and lease acquisition and retention</b>					
(a) Permit fees and acquisition costs	405	—	—	51	1 329 087
(b) Non-producing acreage retention costs	1 845	—	—	6 186	132 821
(c) Producing lease and surface rentals	601	—	—	687	37 009
Exploratory drilling	292 686	—	—	407 272	2 705 974
Development drilling	—	—	—	37 573	1 308 841
<b>Other capital expenditures</b>					
(a) Tangible well and lease equipment	453	—	—	54 584	811 663
(b) Pipelines and related facilities	—	—	—	23	76 135
(c) Secondary recovery and pressure maintenance projects	—	—	—	11 879	177 477
(d) Natural gas processing plants	—	—	—	442	311 559
(e) All other capital expenditures	25 864	—	—	28 787	297 767
Field, well and pipeline operations	—	—	—	17 841	1 207 497
Natural gas plant operations	—	—	—	1 140	405 266
<b>Other operating expenditures</b>					
(a) Taxes (excluding income taxes)	194	—	—	73	179 247
(b) Royalties	—	—	—	5 045	4 380 161
(c) Interest expense	39	—	—	555	451 266
(d) Other	629	—	—	4 865	247 576
<b>Total</b>	<b>380 390</b>	<b>—</b>	<b>144</b>	<b>618 528</b>	<b>14 774 231</b>

**Figure 18**  
**Oil and Gas Exploration Expenditures**  
**Submitted for Work Credits**





# Production, Processing and Refining

## Norman Wells Oil Field

The Norman Wells oil field, located in the west central part of the Northwest Territories, had 57 oil wells capable of production in 1980, with 31 producing regularly. Total gross field production during the year averaged 412.9 m<sup>3</sup>/d of oil (an increase of 24.3 m<sup>3</sup>/d over 1979) plus 22.5 × 10<sup>3</sup>m<sup>3</sup>/d of gas (a decrease of 9.1 10<sup>3</sup>m<sup>3</sup>/d) for a yearly total of 150.7 10<sup>3</sup>m<sup>3</sup> of oil and 8.2 10<sup>6</sup>m<sup>3</sup> of gas.

The only refinery in Canada located north of 60° is located at Norman Wells and is operated by Esso Resources Canada Ltd. It has a calendar day capacity of 508 m<sup>3</sup>. In 1980, the refinery processed an average of 433 m<sup>3</sup>/d of locally produced crude oil. The total refinery output of all products during 1980 was 100.5 10<sup>3</sup>m<sup>3</sup>.

## Pointed Mountain Gas Field

In the Northwest Territories six gas wells (G-62, K-45, O-46, P-53, F-38 and A-55) produced gas at a combined gross average rate of 1.15 10<sup>6</sup>m<sup>3</sup>/d plus 55 m<sup>3</sup>water/d for a yearly total of 418.58 10<sup>6</sup>m<sup>3</sup> of gas and 20,220.9 m<sup>3</sup> of water. At year-end O-46 and F-38 were suspended because of excess water production.

## Kotaneelee Gas Field

In the Yukon Territory only one well (Kotaneelee YT H-38) produced gas at a combined gross average rate of 56.07 10<sup>3</sup>m<sup>3</sup>/d plus 1.01 m<sup>3</sup>water/d for a yearly total of 20 468.7 10<sup>3</sup>m<sup>3</sup> of gas and 372 m<sup>3</sup> of water.



Photo 4  
Eso Issungnak 2-O-61 Artificial Island Well (Courtesy Esso Resources)

# Pipelines and Development Projects

## Polar Gas Project

Seventy million dollars spent on research and development in the Arctic has yielded technological advances to the extent that the Polar Gas Project will be re-submitted for approval to the National Energy Board.

The sponsors of the Polar Gas project, Trans Canada Pipelines Ltd., Panarctic Oil Ltd., Tenneco Oil of Canada Ltd., Ontario Energy Corporation and Petro-Canada Inc., are presently working on the submission.

The new proposal would reduce the number of sea crossings from five to two. The larger of these crossings, from Melville Island to Victoria Island across the M'Clure Strait, will be 122 km long and at a maximum depth of 503 m, while the second will be 31 km long at a maximum depth of 122 m. The proposal points out that, in 1976, pipe had been laid in depths of nearly 400 m in the Arctic and that there are companies currently installing pipelines to depths of 640 m in the Mediterranean Sea.

The proposal offers several route choices. All consist of a 'Y'-line that conveys gas from the Sverdrup Basin through one arm of the "Y", and from the Beaufort Sea through the other. The gas then is transported south to the Trans Canada pipeline system either in Alberta or at some point to the east. All proposed routes will pass through Longlac, Ontario. The stem of the 'Y' will be 42" pipe capable of handling a maximum of 93 million m<sup>3</sup> with an initial planned volume of 61 million m<sup>3</sup>. The laterals will be somewhat smaller. The project estimates that the initial volume is equivalent in energy value to 370 000 b/d of oil.

The pipeline could be in place within seven to ten years although the Project claims "major economic benefits associated with the construction of the pipeline would commence within four years."

Preliminary estimates of construction costs indicate that \$7.1 billion (1978) would be sent to completion.

The proposal claims that a pipeline is the best means of transporting gas from the Arctic as long as sufficient volumes are available. It asserts that a pipeline is 94 per cent efficient and compares this with an approximate figure of 75 per cent for Liquefied Natural Gas (LNG) tankers. Close to 600 billion m<sup>3</sup> reserves would be required to justify the pipeline construction.

## Petro-Canada Arctic Liquefied Natural Gas (LNG) Pilot Project

An application was filed with the National Energy Board in January 1979 requesting approval of a combined pipeline and liquefied natural gas (LNG) tanker project to move a daily average volume of 7.065 10<sup>6</sup>m<sup>3</sup> of gas from Melville Island to an east coast port. The following information outlines the main aspects of this program.

### General

Project partners: Petro-Canada; Alberta Gas Trunk Line Co. Ltd. (AGTL); Melville Shipping Ltd.

Cost of project: \$1.0 billion (1977), excluding field development

Date of application to National Energy Board to export gas: January 17, 1979

Development time and money spent to date: Two years and \$11 million

Construction time: Four years (10 000 man-years for ships; 13 000 man-years for other aspects of the project).

Project life: 20 years

### Natural Gas Field Development

Ownership: Panarctic Oils Ltd. 100 per cent  
Field location: Drake Point Field, Melville Island, N.W.T.

Field gas reserves: 156 10<sup>9</sup>m<sup>3</sup>

Gas reserves required for project: 54 10<sup>9</sup>m<sup>3</sup>

Cost of field development: \$80 million (1977)

Number of wells: Eight onshore wells.

Operating staff: 21

### **Pipeline**

Ownership: Petro-Canada 55 per cent; AGTL 45 per cent

Length: From field to Bridport Inlet — 160 km

Diameter: 560mm

Pipeline cost: \$93 million (1977)

Operating staff: six

### **LNG Facilities**

Ownership: Petro-Canada 55 per cent; AGTL 45 per cent

Location: Bridport Inlet, southern coast, Melville Island, N.W.T.

Terminal costs: \$455 million (1977)

Length of main pier: 600 m

Terminal storage capacity: 200 000 m<sup>3</sup>, barge mounted

Operating staff: 54

### **Ocean Transportation**

Ownership: Petro-Canada 33 per cent; AGTL 27 per cent; Melville Shipping Ltd. 40 per cent (Partners in Melville Shipping are Federal Commerce and Navigation Ltd., Upper Lakes Shipping Ltd., Canada Steamship Lines (1975) Ltd.)

Number of ships: Two

Classification: Arctic Class-7 ice-breakers

Length of ships: 375 m

Beam of ships: 43 m

LNG capacity for each ship: 140 000 m<sup>3</sup>

Power level: 150 MW (megawatts) — gas turbine electric (five times that of standard LNG carriers of comparable size)

Propulsion: three fixed pitch propellers per ship

Length of voyage: 33-day round trip in winter  
16-day round trip in summer

Cost of two LNG carriers: \$422 million (1977) each

Operating staff: 42 per crew (four crews)

### **Southern Receiving Terminal**

Ownership: Petro-Canada 55 per cent; AGTL 45 per cent

Three possible locations:

Lorneville, New Brunswick

Strait of Canso, Nova Scotia

St. Lawrence River, Quebec

Terminal costs: \$93 million (1977)

Terminal storage capacity: 200 000 m<sup>3</sup> in two tanks

Operating staff: 15

It is proposed that the LNG be regasified at one of the three prospective terminal points and distributed to eastern Canadian customers via a new distribution pipeline. By displacement, additional gas would be available for export to United States markets from Alberta.

There it will be loaded aboard two ice-breaking tankers — estimated to cost \$530 million each — for shipment to a yet-undetermined port in south-eastern Canada for regasification.

The ice-breaking tankers and the regasification plant are still in the design stage.

Environment reviews of the proposed southern terminal are expected to begin soon.

The shipment of Arctic gas to Eastern Canada would free western Canadian gas for export to the United States. The sale of gas to the United States is subject to regulatory approval in Canada and the United States. The agreement calls for the delivery by 1985 of 13 10<sup>6</sup> m<sup>3</sup> of gas daily. Under the plan, 7 10<sup>6</sup> m<sup>3</sup> of gas daily would be exported from western Canada, beginning in 1983.

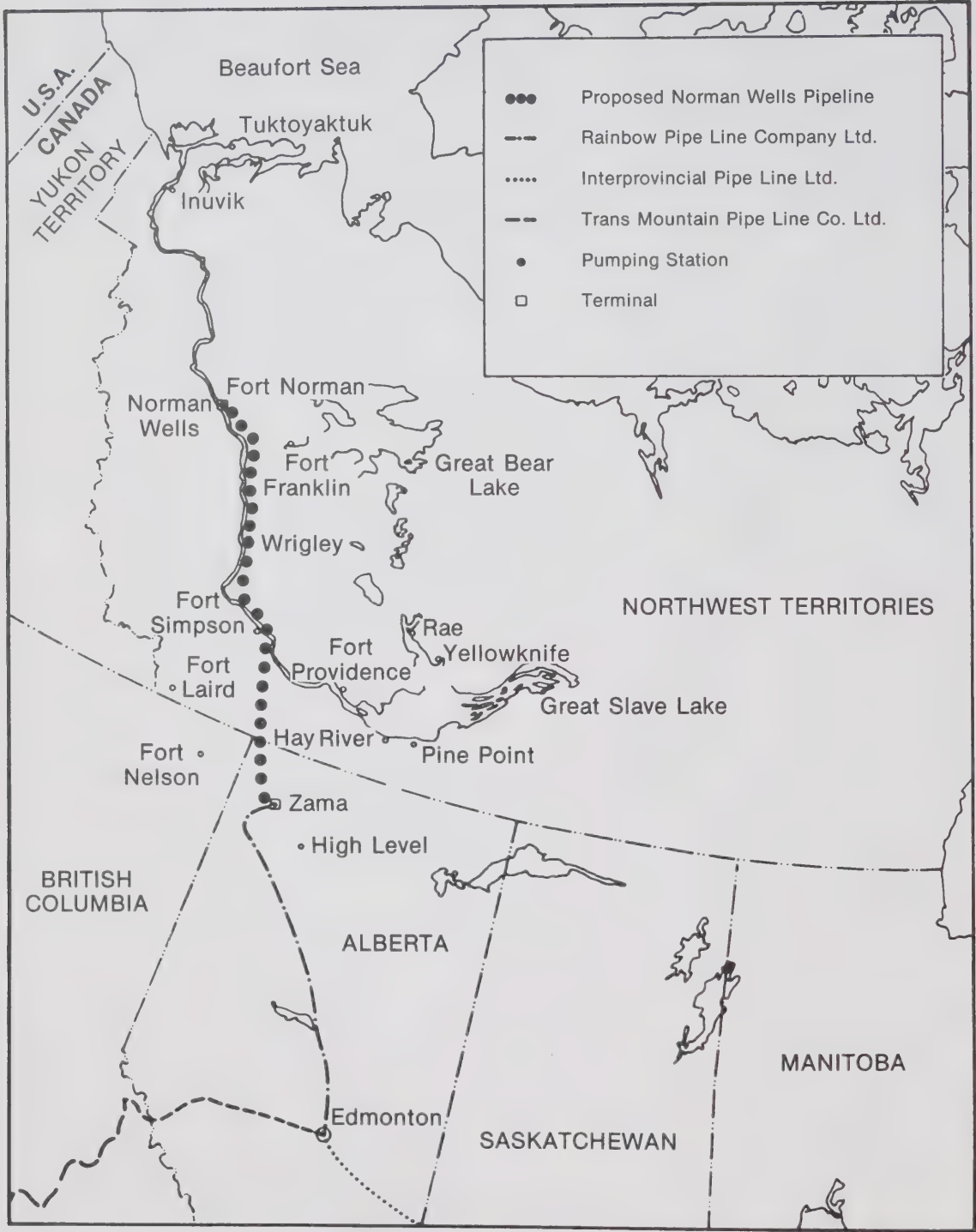


## **Norman Wells Pipeline**

Projected higher demands will make it economic to increase production at the Norman Wells oil field from 3000 barrels per day (477 m<sup>3</sup>d) to 25,000 barrels per day (3975 m<sup>3</sup>d) by drilling more wells and installing a waterflood operation. Plans to achieve this rate of production were completed in 1979 and applications for their approval were submitted to regulatory bodies in 1980.

Interprovincial Pipelines has made application to the National Energy Board for permission to build a single, 300 mm pipeline from Norman Wells to carry crude oil to northern Alberta where connecting pipelines would transport it south. The hearings commenced in October, 1980 and will last four to five months. Interprovincial Pipelines estimates that if the necessary approval is received before the fall of 1980, the line could be completed by 1983.

Figure 19  
Northern Pipelines



# Surveys and Studies



Photo 5  
Eso Alerk Artificial Island (Courtesy Esso Resources)

There were fewer participation and research projects in 1980 than in the previous year. In the Beaufort Sea, Esso Resources and Dome Petroleum continued their studies of ice and structures stability. In addition, Dome carried out ice-breaking studies during the winter months to ascertain the feasibility of carrying out year-round operations in the Beaufort Sea.

In Davis Strait, Petro Canada completed the projects started under the EAMES program. The object of these studies is the gathering of base-line data for future drilling in the Eastern Arctic.

## Geophysical Surveys

Geophysical Services Incorporated (GSI) carried out limited seismic surveys in the Beaufort Sea and Davis Strait in 1980. Due to the early arrival of winter ice none of the programs could be completed and the GSI indicated that the projects will be continued in 1981.

## Research Programs

### APOA and COOSRA

Members of APOA conducted very few programs in 1980. The main thrust of the organization was to organize COOSRA (Canadian Offshore Oil Spill Research Association) with 16 members, all active in the offshore frontier areas of Canada. The objectives of the Association are to increase the collective understanding of oil spills and the manner of coping with them safely, promptly and with minimal environmental damage. Many of the APOA on-going projects were transferred to COOSRA. The main project Baffin Island Oil Spill (BIOS) was completed during the year.

The 1981 COOSRA budget exceeds \$1 million all of which will be directed to the study of oil spill technology.

### Meteorological Station at Malloch Dome

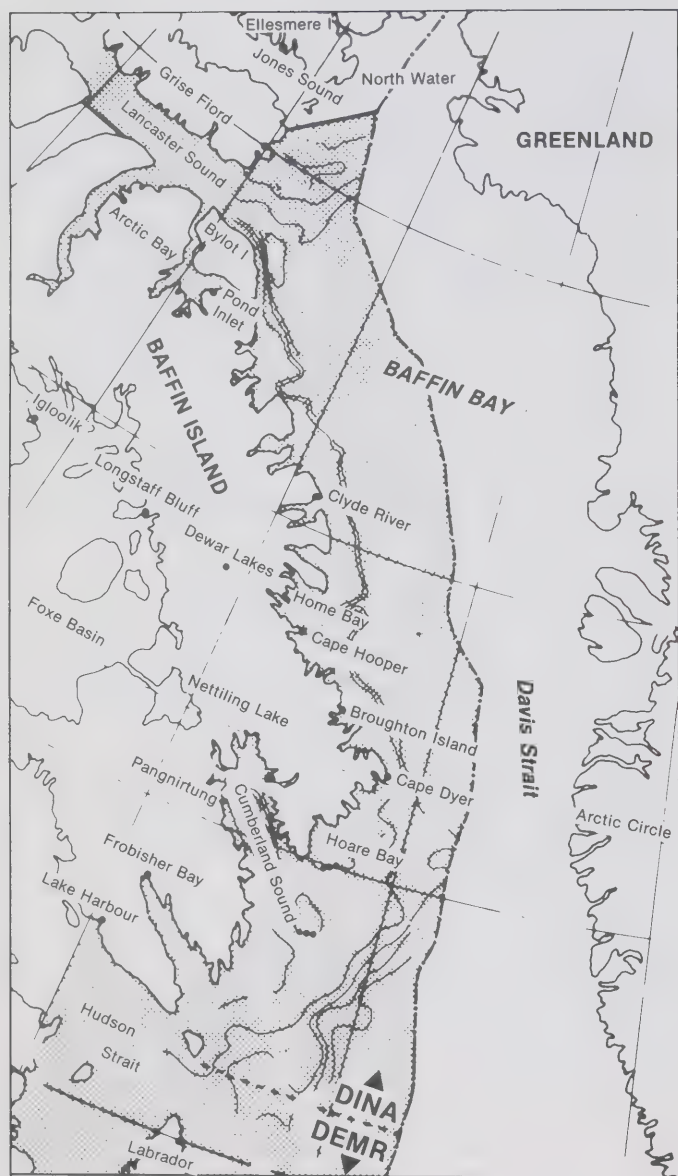
The world's most northerly weather station at Malloch Dome, reporting directly to the American Geostationary Operation Environmental Satellite (GOES), became operational in 1980 in the Canadian Arctic.

Trans Canada Pipelines reports that it installed the unmanned station to assist in the design and operation of a proposed LNG port facility at Ellef Ringnes Island.

Twenty years of meteorological data is required for the design of port facilities, the overall planning of the site and the preparation of navigation procedures. The new data will be related to historical data recorded at Resolute and Isachsen.



**Figure 20**  
**Eastern Arctic Marine Environmental Study**  
**Area (EAMES)**  
 (Shading indicates survey area)



The weather station is on the very fringe of access to the satellite which is located over the equator. Wind direction and temperature is relayed every three hours to the United States and ultimately to Arctic Weather Forecasting in Edmonton where it is assembled together with information from manned stations at Mould Bay, Eureka and Resolute to provide the High Arctic weather forecasts.

#### **Eastern Arctic Marine Environmental Studies**

In November 1977, the Minister of Indian Affairs and Northern Development announced the setting up of a study program for the offshore areas of the eastern Arctic. Its objective is to provide sufficient environmental impact data on which decisions for the granting or withholding of exploratory drilling permits at sites in the area can be made. The program is known as the Eastern Arctic Marine Environmental Studies (EAMES) and covers the area indicated in Figure 20. The waters of the east coast of Baffin Island are of principal interest as they overlie formations considered potentially high in oil and gas.

Before drilling is permitted it was considered essential that the environmental conditions and constraints be determined in order to protect all segments of the ecology and to ensure that adequate techniques, safeguards and remedies are known and available to cope with any possible disturbances or emergencies that drilling might create. This was the first time the initial approach to the exploration of a region involved the study of its total ecology as a whole rather than limiting research to the environment of a specific area.

The most vital areas are Lancaster Sound, Baffin Bay and Davis Strait. The research is expected to take four years, but in view of the urgent need for oil, every effort is being made to reduce this time. Most studies by industry have already been completed.

Three federal departments, Energy, Mines and Resources, Environment, and Indian Affairs and Northern Development, are involved. The management committee is chaired by a representative from Indian Affairs and Northern Development, but the work itself is the responsibility of industry. The federal departments, of course, co-operate by providing any facilities or studies they alone can give. As much use as possible is made of the local Inuit knowledge and skills and the native people of the eastern Arctic are included and actively involved in the planning and conducting of the studies. In addition to four specialists familiar with the coastal and offshore environment and two representatives of the petroleum industry, the Advisory Board set up to assist the management committee also includes local and native representatives from ten communities in the area.

All environmental elements of the area are included in the program, land aspects as well as marine: wildlife, climate, freshwater and saltwater areas, the shallow as well as the deep sea-waters, ice conditions, waves and currents, the effects of possible oil spills and the techniques to be developed to deal with them, and any other aspect that may, in the course of the study, be found to be relevant. The program is being jointly funded by the federal government and industry, with industry's share being the larger. Costs are anticipated to be well in excess of \$12 million (1977).

In 1979, emphasis was on the completion of the projects started under EAMES in 1978. These dealt mainly with ice mechanics and ice defence systems research. Esso Resources, Aquitaine and other operators completed major environmental research projects in Baffin Bay as a requirement for their application for drilling authorities.

#### **Lancaster Sound Regional Study**

In response to a 1977 application by Norlands Petroleum Ltd. for a drilling authority in Lancaster Sound, the Federal Environmental Assessment Review Office established a panel to hold public hearings to identify the various potential resource-use conflicts.

In its report to the Minister of the Environment, the panel concluded that the combination of physical characteristics, biological uniqueness and logistical problems would demand an ultra-conservative approach to drilling in the area.

The many inadequacies in the information presented and in the preparations proposed by the oil company led the panel to recommend that drilling be deferred until these deficiencies could be corrected. The panel further concluded that a much broader review was needed for the present and future uses of Lancaster Sound, in order to avoid committing the Department of Indian Affairs and Northern Development to a course of action prejudicial to the optimum conservation and utilization of all resources in the area. Specifically, it was recommended that the department, as the responsible federal co-ordinating and planning body, consider, "...with adequate national and regional public input and taking into account the various forces at work, the best use(s) of the Lancaster Sound Region."

Following the recommendations of the panel, a Lancaster Sound Regional Study was initiated with the object of producing a green paper. (A green paper is intended to provide a clear description of the issues in question and to outline a range of options available for their resolution.)

An interdisciplinary working group has been assembled from staff of five federal government departments and from the government of the Northwest Territories to conduct the study and produce a draft green paper.

In the context of the present Lancaster Sound Regional Study, the green paper is a tool for bringing about organized and thorough discussion on the optimum future uses of the marine and land areas by the residents of the Lancaster Sound region, interested organizations, and concerned members of the public.

The present plans call for this green paper to be released in December 1981.

# Appendix I

## Sources of Information

### Publications

#### Maps

Many maps dealing with the northern resource activities are published by the Northern Non-Renewable Resources Branch, Department of Indian Affairs and Northern Development (DINA), and are available from the Oil and Gas Exploratory Operations Section, Calgary, Alberta, or from the Director, Northern Non-Renewable Resources Branch, Ottawa. The Branch publishes a list of maps which may be obtained without charge from either of the above sources.

#### Reports

The following reports may be obtained from Supply and Services Canada, Printing and Publishing. Prepayment is required.

Schedule of Wells 1921-1979	\$35.00
Oil and Gas Statistical Report No. 2 (1921-1972)	5.00

*Technical Reports available for Inspection 1920-80*  
(Geological and geophysical reports released from confidential status are available for public inspection only in the office of the Oil and Gas Exploratory Operations Section, DINA, in Calgary) — No charge.

### Other Sources of Information

Information on northern resource activities may be obtained from the Director, Northern Non-Renewable Resources Branch, DINA, Ottawa, Ontario. Cores and samples from wells drilled on Canada lands north of 60°N, except the Baffin Bay-Davis Strait region, are stored at the Institute of Sedimentary and Petroleum Geology, 3303-33rd St. N.W., Calgary, Alberta. Cores and samples from wells drilled in the Baffin Bay-Davis Strait region are stored at the Atlantic Geoscience Centre, Box 1006, Dartmouth, Nova Scotia. Such samples and cores for wells as have been released from confidential status pursuant to the Canada Oil and Gas Land Regulations and the Canada Oil and Gas Drilling Regulations may be inspected at these locations. Further, one set of samples is stored under the auspices of the Regional Oil and Gas Conservation Engineer, at the DINA Corehouse in Yellowknife. A list of such wells may be obtained from the Director, Northern Non-Renewable Resources Branch. Specialized and technical literature pertaining to northern Canada may be obtained from the following:

#### Department of Indian Affairs and Northern Development

- (1) Departmental Library, 10 Wellington St., Hull, Quebec
- (2) Oil and Gas Exploratory Operations Section, Department of Indian Affairs and Northern Development, Calgary, Alberta

#### Department of Energy, Mines and Resources

- (1) Geological Survey of Canada — Ottawa, Ontario and Vancouver, British Columbia.
  - a. Institute of Sedimentary and Petroleum Geology — Calgary, Alberta.
  - b. Atlantic Geoscience Centre, Bedford Institute of Oceanography — Dartmouth, Nova Scotia.
  - c. Cordilleran Division, Vancouver, British Columbia.
  - d. Pacific Geoscience Centre, Patricia Bay Institute of Ocean Sciences — Sidney, British Columbia.
- (2) Earth Physics Branch — Ottawa, Ontario.



**Department of National Defence**

Research and Development, Scientific Information Service — Ottawa, Ontario.

**Transport Canada**

- (1) Canadian Coast Guard — Ottawa, Ontario.  
Branches:
  - (a) Aids and Waterways
  - (b) Fleet Systems
  - (c) Ship Safety
  - (d) Coast Guard Emergencies
  - (e) Telecommunications and Electronics Branch, Edmonton, Alberta and Ottawa, Ontario.
- (2) Civil Aviation Branch — Winnipeg, Manitoba.

**Arctic Institute of North America —**  
Calgary, Alberta.

**National Research Council of Canada —**  
Ottawa, Ontario

**Public Libraries**

The following brochures published by the Department of Indian Affairs and Northern Development may be available in some public libraries:

- (1) Guide to Northern Non-Renewable Resources
- (2) Communication and Transportation Facilities  
Queen Elizabeth Group — Arctic Islands
- (3) Resources Management Division — Responsibilities and Administration
- (4) Oil and Gas Canada Lands — Volume No. 2
- (5) Oil and Gas Canada Lands — Edition No. 3
- (6) Oil and Gas in the Yukon and Northwest Territories — Edition No. 4 — 1967
- (7) Oil and Gas — North of 60 — (annual editions 1968-1979)
- (8) Prospectus — North of 60
- (9) Procedures, Licensing, Legislation & All That

**Information and Procedures Concerning Operations of Canada Lands**

Certain federal agencies are concerned with exploration of Canada lands and must be notified prior to the commencement of any exploration activity. The operator or permittee, not the contractor, is responsible for providing the requisite advance notice of planned programs to these agencies by writing directly to them.

For offshore programs, the Northern Non-Renewable Resources Branch, DINA, as well the Director, Northwest Territories Region, Northern Affairs Program, DINA, at Yellowknife, Northwest Territories, must be informed with respect to each program. He will communicate with every department and agency on a need-to-know basis with respect to Marine Geophysical Programs. In the case of the Hudson Bay region, operators must also inform the National Research Council of Canada of proposed operations to be undertaken during the summer.

Circumstances may be such that other agencies should be notified as well, and these are listed on the following pages, together with the names of persons who can be of assistance. For example, since operators are responsible for any damage they may cause to underwater commercial cables, it is recommended that they contact the Canadian Hydrographic Service for cable-lay data covering the area over which the work is to be performed. Similarly, the Department of National Revenue, Customs and Excise should be contacted by the importing company if vessels or equipment are to be brought in from abroad.

Information in the brochure *Communication and Transportation Facilities Queen Elizabeth Group, Arctic Islands* is being updated and will be available in a comprehensive report entitled *Operational Guide for Oil and Gas Companies in the North*. This publication is now in preparation. In addition to information concerning communication and transportation, the report will contain information covering all aspects relating to exploration in the North.

Information in the brochure *Procedures, Licensing, Legislation & All That* outlines some of the procedures and requirements regarding Northern Natural Resource Development. Copies may be obtained from the Regional Directors in Yellowknife and Whitehorse.

## **Department of Indian and Northern Affairs**

Pursuant to Section 52 of the Canada Oil and Gas Land Regulations, Notice of Commencement of Exploratory Work must be filed:

- 15 days prior to the commencement of proposed exploratory programs (geophysical, geological and research) on the mainland Northwest Territories, in the Arctic Islands and in the Yukon Territory.
- 45 days prior to commencement of geophysical work in offshore areas with the:

Oil and Gas Exploratory Operations Section  
Northern Non-Renewable Resources Branch  
Department of Indian and Northern Affairs  
P.O. Box 2638, Station "M"  
Calgary, Alberta  
T2P 3C1.

Information and assistance may also be obtained from:

Director  
Northern Non-Renewable Resources Branch  
Department of Indian and Northern Affairs  
Ottawa, Ontario K1A 0H4

Contact: Dr. H.W. Woodward  
Telephone: (819) 997-9339  
Telecopier: (819) 997-9542

or from:

Chief  
Oil and Gas Lands Division  
Contact: P. Sullivan  
Telephone: (819) 997-9741

Advice on specific oil and gas rights and oil and gas title matters may be obtained from:

Land Manager  
Oil and Gas Land Rights Section  
Contact: J.A.S. Barrett  
Telephone: (819) 997-0877

Advice on exploratory programs and operational matters may be obtained from:

Head,  
Oil and Gas Exploratory Operations Section  
Contact: S.A. Kanik  
Telephone: (819) 997-9444

Drilling authority and advice on drilling matters can be obtained from the Regional Conservation Engineer for the appropriate region.

## **Oil and Gas Engineering Division**

- Chief Petroleum Engineer — Appointment pending
  - Head, Drilling and Completion Engineering Section — Appointment pending
  - Head, Production Systems Engineering and Special Projects Section — Appointment pending
  - Head, Pipelines and Transportation Engineering Section — T.G. Starr
  - A/Head, Reservoir Engineering Section — J.D. Boggs
  - Regional Oil and Gas Conservation Engineer, N.W.T. — Appointment pending
  - Oil and Gas Conservation Engineer, N.W.T. — Appointment pending
- Yellowknife,  
N.W.T.  
(403) 920-8175

A land use permit must be acquired for every land use operation, including drilling operations. A water licence or water authorization is required for all water use in accordance with the Northern Inland Waters Act and Regulations. Advance notice of 90 days is required before the start of drilling operations and all seismic activities, including marine seismic surveys involving the use of high explosives, in the event that qualified observers are needed. Notice of 45 days to the regional director is required before the start of a seismic survey in which a source of acoustical energy, other than high explosives, is to be used.

Information and advice on the Land Use Regulations, land use permits and water use authorization may be obtained:

For the Northwest Territories:

Director,  
Northwest Territories Region,  
Northern Affairs Program,  
Department of Indian Affairs and Northern  
Development,  
P.O. Box 1500,  
Yellowknife, Northwest Territories X0E 1H0

Contact: R. Hornal  
Telephone: (403) 920-8111

For the Yukon Territory:

Director,  
Yukon Territory Region,  
Northern Affairs Program,  
Department of Indian Affairs and Northern  
Development,  
200 Range Road,  
Whitehorse, Yukon Territory, Y1A 3V1

Contact: D. Watson  
Telephone: (403) 668-5151

## **Department of Energy, Mines and Resources**

### **Resource Management Branch**

The Resource Management Branch is responsible for the administration of federal interests in the mineral resources off Canada's east and west sea-coasts and in the Hudson Bay and Hudson Strait regions.

As a general rule all correspondence should be addressed to:

Dr. D.G. Crosby  
Director-General  
Resource Management Branch  
Department of Energy, Mines and Resources  
Ottawa, Ontario K1A 0E4

The Branch may be reached by:

Telephone: (613) 996-5707  
Telex: 053-4366  
Telecopier: (613) 996-5707

The Mineral Rights Division of the Branch, through the issuance of exploration permits and production leases, makes available rights to mineral development on all Canada lands in the offshore excluding the High Arctic; and ensures that holders of such terminable grants fulfill the terms and obligations stipulated in the regulations in order to maintain their interests in good standing.

Advice and assistance on matters relating to the disposition and administration of mineral rights, such as the issuance and terms of permits and leases and expenditures allowable for credit against permit or lease work obligations may be obtained from D.P. Tough, Director, Mineral Rights Division.



The Resource Geology Division of the Branch evaluates geological and geophysical information submitted by offshore operators and assesses the mineral resource potential of prospects and specific areas in Canada's offshore regions, as well as for federally owned mineral rights in the provinces, for resource management purposes. The Division is also responsible for the handling and curation of lithologic and paleontologic material from offshore wells and for the assembly and maintenance of a data bank of geological and geophysical information from the offshore.

Requirements and procedures with regard to the submission, confidentiality and subsequent examination of geophysical and geological data, including well materials, as well as sources of geological information and related matters, may be obtained from D.F. Sherwin, Director, Resource Geology Division.

The Operations and Conservation Division of the Branch exercises regulatory control over all activities associated with exploration, drilling, production and conservation of offshore oil and gas. This control includes the analysis of operational hazards, of proposed equipment and installations in the offshore and the nature and economic potential of reservoirs. Operators must meet the requirements of the Division regarding the safety of personnel, the protection of the environment, the prevention of pollution and waste, and the conservation of resources.

Assistance on such operational matters as the drilling, testing, completion or plugging of offshore wells; offshore structures; geophysical surveys; reporting requirements; pollution contingency plans; offshore environmental and feasibility projects; and the availability of reports after their release from confidential status may be obtained from the office of:

Director  
Operations and Conservation Division  
Resource Management Branch  
Department of Energy, Mines and Resources  
Ottawa, Ontario K1A 0E4

Contact: G.R. Yungblut  
Telephone: (613) 993-3760  
After hours: (613) 722-9286

or from other engineers in the Division including:

F.H. Lepine  
Head  
Drilling and Operations Section  
Department of Energy, Mines and Resources  
Telephone: (613) 993-3760

On the east coast, information and assistance on operational matters in the Maritimes Region and facilities for the examination of well materials, and exploration and assessment reports for all of the east coast, is available from the Branch's maritime regional office in Dartmouth:

Offshore Manager — Maritime Region  
Resource Management Branch  
Department of Energy, Mines and Resources  
Bedford Institute of Oceanography  
P.O. Box 1006  
Dartmouth, Nova Scotia B2Y 4A2  
Contact: T.W. Dexter  
Telephone: (902) 426-3179  
After hours: (902) 477-5886

In St. John's, Newfoundland, information and assistance on operational matters in the Newfoundland Region is available at the Branch's Newfoundland regional office.

Offshore Manager — Newfoundland Region  
Resource Management Branch  
Department of Energy, Mines and Resources  
P.O. Box 127, Station "C"  
St. John's, Newfoundland A1C 5H5  
Contact: D. Hunt  
Telephone: (709) 737-2125  
After hours: (719) 753-3368

The Environmental Assessment Division of the Branch assesses the environmental and sociological consequences of offshore mineral resource activity to ensure that projects are environmentally safe, and socially and economically acceptable to the region's coastal communities.

The Division's responsibilities include: the evaluation of weather, sea and ice conditions in operational areas; the assessment of the effects of offshore operations on the marine and coastal biota; the approval of oil spill contingency plans submitted by industry; and the promotion of environmental research such as the Offshore Labrador Biological Studies (OLABS) Programme.

For further information contact:

Mr. Bell, Director  
Environmental Assessment Division  
Resource Management Branch  
Department of Energy, Mines and Resources  
Ottawa, Ontario K1A 0E4

#### **Surveys and Mapping Branch**

Information on the systems, methods and equipment used for positioning and surveying of exploration work may be subject to review by this agency. Moreover, legal surveys must be made in accordance with instructions of the Surveyor General.

Enquiries concerning surveying may be directed to:

A/Surveyor General and Director  
Legal Surveys Division  
Surveys and Mapping Branch  
Department of Energy, Mines and Resources  
Ottawa, Ontario K1A 0E9

Contact: G. Raymond  
Telephone: (613) 995-4341

Information concerning control surveys may be obtained from:

Geodetic Survey Division  
Surveys and Mapping Branch  
Department of Energy, Mines and Resources  
Ottawa, Ontario K1A 0E9

Contact: F.W. Mosienko  
Telephone: (613) 995-4024

When requesting control survey data, the area involved should be defined by latitude and by longitude, and the request should indicate that the data are required for oil and gas exploration related surveys.

Air photographs covering all portions of Canada may be obtained from:

National Air Photo Library  
Surveys and Mapping Branch  
Department of Energy, Mines and Resources  
615 Booth St.  
Ottawa, Ontario K1A 0E9

Contact: D. Rombough  
Telephone: (613) 995-4552

and

Publications and Air Photo Section  
Institute of Sedimentary and Petroleum Geology  
Department of Energy, Mines and Resources  
3303 - 33rd Street, N.W.  
Calgary, Alberta T2L 2A7

Contact: Mrs. D. Cormier  
Telephone: (403) 284-0110

Topographic maps, aeronautical charts and numerous other map publications may be obtained from:

Canada Map Office  
Surveys and Mapping Branch  
Department of Energy, Mines and Resources  
615 Booth St.  
Ottawa, Ontario K1A 0E9

Contact: P.K. Andrews  
Telephone: (613) 998-9900

or

Mining Recorder  
Department of Indian Affairs and Northern  
Development  
Map Office  
P.O. Box 1500  
Yellowknife, Northwest Territories X1A 2R3

or

Regional Geologist  
Department of Indian Affairs and Northern  
Development  
200 Range Road  
Whitehorse, Yukon Territory Y1A 3V1

or

Information Service and Sales  
Geological Survey of Canada  
Department of Energy, Mines and Resources  
100 West Pender St., 6th Floor  
Vancouver, British Columbia V6B 1R3

or

Maritimes Resource Management Services  
Information Centre  
Department of Energy, Mines and Resources  
P.O. Box 310  
16 Station St.  
Amherst, Nova Scotia B4H 3Z5

or

Ministère de l'Énergie des Mines et des  
Ressources  
Bureau régional de vente de cartes  
1535 Chemin Ste-Foy  
Québec (Québec) G1S 2P1

### **Geological Survey of Canada**

The Geological Survey of Canada carries out systematic geological and geophysical surveys in the sedimentary basins of Canada, including parts of the regions offshore from the east and west coasts, in Hudson Bay, and in the Arctic Islands.

Enquiries regarding operations and publications of the Geological Survey should be made to:

For operations:

Chief Program Officer  
Geological Survey of Canada  
Department of Energy, Mines and Resources  
601 Booth Street  
Ottawa, Ontario K1A 0E8

Contact: D.G. Benson (acting)  
Telephone: (613) 995-4182

For publications:

Publications Services  
Geological Survey of Canada  
Department of Energy, Mines and Resources  
601 Booth Street  
Ottawa, Ontario K1A 0E8

Contact: J.L.L. Touchette  
Telephone: (613) 995-4342

or

Director  
Institute of Sedimentary and Petroleum Geology  
Geological Survey of Canada  
Department of Energy, Mines and Resources  
Calgary, Alberta T2L 2A7

Contact: W.W. Nassichuk  
Telephone: (403) 284-0110



or

Director  
Atlantic Geoscience Centre  
Geological Survey of Canada  
Department of Energy, Mines and Resources  
P.O. Box 1006  
Dartmouth, Nova Scotia B2Y 4A2  
Contact: M.J. Keen  
Telephone: (902) 426-2367

or

Director  
Cordilleran Division  
Geological Survey of Canada  
Department of Energy, Mines and Resources  
100 W. Pender Street  
8th Floor  
Vancouver, British Columbia V6B 1R8  
Contact: R.B. Campbell  
Telephone: (604) 666-1529

or

Head, Marine Geology Section  
Pacific Geoscience Centre  
Geological Survey of Canada  
Department of Energy, Mines and Resources  
Box 6000  
Sidney, British Columbia V8L 4B2  
Contact: C.Y. Yorath  
Telephone: (569) 656-8418

#### **Polar Continental Shelf Project**

The Polar Continental Shelf Project is a continuing investigation of the continental shelf fringing the Arctic coast of Canada, adjacent parts of the Arctic Ocean basin, the islands of the Canadian Arctic Archipelago and the intervening waters, and other areas of special interest.

Enquiries regarding surveys and scientific studies in Arctic areas may be directed to:

Director  
Polar Continental Shelf Project  
Department of Energy, Mines and Resources  
Ottawa, Ontario K1A 0E4  
Contact: G. Hobson  
Telephone: (613) 996-3388

#### **Earth Physics Branch**

The Earth Physics Branch operates a network of Arctic geophysical observatories and carries out systematic geophysical surveys and studies throughout Canada including the Arctic.

Enquiries regarding the scientific studies, surveys and publications of the Earth Physics Branch should be directed to:

Director-General  
Earth Physics Branch  
Department of Energy, Mines and Resources  
Ottawa, Ontario K1A 0Y3  
Contact: K. Whitham  
Telephone: (613) 995-5464

### **Department of Fisheries and Oceans**

#### **Fisheries Management**

Information may be obtained:

on Yukon freshwater and marine fish from:

Director-General  
Fisheries Management  
Fisheries and Oceans  
1909 West Pender Street  
Vancouver, British Columbia V6E 2P1  
Contact: Dr. E. Johnson  
Telephone: (604) 666-6097

on Northwest Territories freshwater fish, including Arctic char from:

Director-General  
Fisheries Management  
Fisheries and Oceans  
Freshwater Institute  
501 University Crescent  
Winnipeg, Manitoba R3T 2N6  
Contact: Dr. G.H. Lawler  
Telephone: (204) 269-7379

on Northwest Territories, including Hudson Bay, marine fish and marine mammals from:

Director  
Arctic Biological Station  
Fisheries and Oceans  
Ste. Anne de Bellevue, Quebec H9X 3L6  
Contact: Dr. A. Mansfield  
Telephone: (514) 457-3660

General information on environment assessment studies and research relating to contaminants in freshwater and marine water of the Arctic from:

Director  
Aquatic Environment Branch  
Fisheries and Oceans  
240 Sparks Street  
Ottawa, Ontario K1A 0E6  
Contact: Dr. J.C. MacLeod  
Telephone: (613) 995-1818

#### **Ocean and Aquatic Sciences**

The Canadian Hydrographic Service publishes charts of Canadian navigable waters.

General information concerning charts may be obtained from:

Canadian Hydrographic Service  
Department of Fisheries and Oceans  
615 Booth Street  
Ottawa, Ontario K1A 0E6  
Contact: Mr. L.P. Murdoch  
Telephone: (613) 995-4437

Information concerning charts showing Canada's territorial sea and fishing zone limits and related data may be obtained from:

Canadian Hydrographic Service  
Department of Fisheries and Oceans  
615 Booth Street  
Ottawa, Ontario K1A 0E6  
Contact: Territorial Waters Officer  
Telephone: (613) 995-4450

Commercial cable-lay data may be obtained from:

Canadian Hydrographic Service  
Department of Fisheries and Oceans  
615 Booth Street  
Ottawa, Ontario K1A 0E6  
Contact: Mr. J. Bruce  
Telephone: (613) 995-4651

Information on tides may be obtained from:

Tides, Currents and Water Levels  
Canadian Hydrographic Service  
Department of Fisheries and Oceans  
615 Booth Street  
Ottawa, Ontario K1A 0E6  
Contact: Dr. W.F. Forrester  
Telephone: (613) 995-4511

Information on hydrographic surveys and control data in the eastern Arctic may be obtained from:

Regional Hydrographer  
Canadian Hydrographic Service  
Atlantic Oceanography Laboratory  
Department of Fisheries and Oceans  
Bedford Institute of Oceanography  
Dartmouth, Nova Scotia B2Y 4A2  
Contact: Mr. T.B. Smith (Acting)  
Telephone: (902) 426-3497

Information on hydrographic surveys and control data in the western Arctic may be obtained from:

Regional Hydrographer  
Canadian Hydrographic Service  
Department of Fisheries and Oceans  
Institute of Ocean Sciences  
Sidney, British Columbia V8L 4A8

Contact: Mr. M. Bolton  
Telephone: (604) 656-8347

Information related to physical and chemical oceanography may be obtained from:

Western Arctic (Beaufort Sea and Sverdrup Basin):

Director-General  
Ocean and Aquatic Sciences  
Department of Fisheries and Oceans  
Institute of Ocean Sciences  
Sidney, British Columbia V8L 4B2

Contact: Dr. R.W. Stewart  
Telephone: (604) 656-8215

Eastern Arctic (Baffin Bay and Davis Strait):

Director-General  
Ocean and Aquatic Sciences  
Department of Fisheries and Oceans  
Bedford Institute of Oceanography  
Dartmouth, Nova Scotia B2Y 4A2

Contact: Dr. C.R. Mann  
Telephone: (902) 426-3492

Central Arctic (including Hudson Bay and James Bay):

Director  
Ocean and Aquatic Sciences  
Canada Centre for Inland Waters  
Department of Fisheries and Oceans  
P.O. Box 5050  
Burlington, Ontario L7R 4A6

Contact: D.W. McCulloch  
Telephone: (416) 637-4673

Data on physical-chemical oceanography, tidal predictions, wave climate, etc.:

Director  
Marine Environmental Data Service  
Ocean and Aquatic Sciences  
Department of Fisheries and Oceans  
240 Sparks Street  
Ottawa, Ontario K1A 0E6

Contact: Dr. J.R. Wilson  
Telephone: (613) 995-2007

General information on oceanographic activities in the Arctic:

Director-General  
Marine Sciences and Information Directorate  
Ocean and Aquatic Sciences  
Department of Fisheries and Oceans  
240 Sparks Street  
Ottawa, Ontario K1A 0E6

Contact: Dr. N.J. Campbell  
Telephone: (613) 995-2039

## **Department of the Environment**

### **Environmental Protection Service**

This Department should be advised by the Regional Director of Resources, Department of Indian Affairs and Northern Development, of any environmental matters such as drilling operations and all seismic activities, including marine seismic surveys, involving the use of high explosives in the event that qualified observers are needed. Information regarding the department's requirement can be obtained from:

Assistant Deputy Minister  
Environmental Protection Service  
Department of the Environment  
15th Floor, Place Vincent Massey  
Ottawa, Ontario K1A 0H3

Contact: Mr. R.M. Robinson  
Telephone: (819) 997-1575 or 997-1576



Information concerning spills of oil or hazardous materials including prevention programs; reporting systems; location of emergency equipment; mapping of sensitive areas; contingency planning and training; and information on research into new cleanup equipment and materials; behaviour and fate of spills; and the detection and tracking of spills may be obtained from:

Director  
Environmental Emergency Branch  
Environmental Protection Service  
Department of the Environment  
15th Floor, Place Vincent Massey  
Ottawa, Ontario K1A 1C8

Contact: Dr. J.D. Kingham  
Telephone: (819) 997-2037

#### **Environmental Management Service**

Information concerning wildlife such as the locations of migratory bird sanctuaries and National Wildlife Areas, and the Arctic Ecology Map Series that show important and critical wildlife areas of the Canadian Arctic where human activities can have adverse or destructive impact on wildlife population may be obtained from:

Director-General  
Canadian Wildlife Service  
Department of the Environment  
17th Floor, Place Vincent Massey  
Ottawa, Ontario K1A 0H3

Contact: Mr. A. Loughrey  
Telephone: (819) 997-1301

Information concerning research into stream flow; water levels and quality; permafrost hydrology, flood forecasting; river basin planning; sediment surveys; ice studies; and water demand, supply, use, diversion and conservation; oil spills in icy waters; and environmental impact assessment, may be obtained from:

Director-General  
Inland Waters Directorate  
Environmental Management Service  
Department of the Environment  
6th Floor, Place Vincent Massey  
Ottawa, Ontario K1A 0H3

Contact: Mr. N.H. James  
Telephone: (819) 997-2055

Information concerning northern forests and vegetation; their mapping; growth; relationship to terrain, soils and landscapes; and stability, may be obtained from:

Director-General  
Canadian Forestry Service  
Department of the Environment  
19th Floor, Place Vincent Massey  
Ottawa, Ontario K1A 0H3

Contact: Dr. R.J. Bouchier  
Telephone: (819) 997-1454

or

Director  
Petawawa National Forestry Institute  
Canadian Forestry Service  
Department of the Environment  
Chalk River, Ontario K0J 1J0

Contact: R.M. Newnham  
Telephone: (613) 589-2885

or

Director  
Northern Forest Research Centre  
Canadian Forestry Service  
Department of the Environment  
5320 - 122 Street  
Edmonton, Alberta T6H 3S5

Contact: Dr. G.T. Silver  
Telephone: (403) 435-7210

or

A/Director  
Pacific Forest Research Centre  
Canadian Forestry Service  
Department of the Environment  
506 West Burnside Road  
Victoria, British Columbia V8Z 1M5  
Contact: Dr. T.G. Honer  
Telephone: (604) 388-3811

The map series, *Land Use Information Series* (for northern Canada), provides extensive data on renewable resources and related human activities. Coverage now includes all of the Yukon Territory, the Mackenzie Valley and the Great Slave Lake region. Enquiries for obtaining this map series may be directed to:

Canada Map Office  
Department of Energy, Mines and Resources  
Ottawa, Ontario K1A 0E9  
Telephone: (613) 998-9900

Further information on the series may be obtained from:

Lands Directorate  
Department of the Environment  
20th Floor, Place Vincent Massey  
Ottawa, Ontario K1A 0H3  
Contact: Ms. J. Moore  
Telephone: (819) 997-2240

#### **Atmospheric Environment Service**

Requests for information and assistance on meteorological and sea-ice data, climatology, weather forecasting, meteorological instruments and research may be directed to:

Assistant Deputy Minister  
Atmospheric Environment Service  
Department of the Environment  
4905 Dufferin Street  
Downsview, Ontario M3H 5T4  
Contact: Dr. A.E. Collin  
Telephone: (416) 667-4760

Information may also be obtained through the Meteorological Liaison Officer in Ottawa. This position is filled on a rotational basis.

Enquiries in Ottawa may be directed to:

Liaison Meteorologist  
Department of the Environment  
13th Floor, Fontaine Building  
Ottawa, Ontario K1A 0H3  
Contact: F. Lemire  
Telephone: (819) 997-1588

#### **Federal Environmental Assessment Review Office (FEARO)**

FEARO administers the Federal Environmental Assessment and Review Process (EARP). Under EARP all programs, projects and activities initiated or sponsored by federal departments and agencies, or involving federal lands or funds, must be screened for environmental effects. Activities with potentially significant adverse environmental effects must be referred by the initiating federal agency to FEARO for a formal review by an Environmental Assessment Panel. Further information may be obtained from:

Executive Chairman  
Federal Environment Assessment Review Office  
13th Floor, Fontaine Building  
Ottawa, Ontario K1A 0H3  
Contact: Mr. F.G. Hurtubise  
Telephone: (819) 997-3426 or 997-1000

#### **Department of National Defence**

##### **Operations**

The Regional Director of Resources will inform this department of any exploration program proposed for offshore.

Operations in all areas are of interest, to:

National Defence Headquarters  
101 Colonel By Drive  
Ottawa, Ontario K1A 0K2  
Contact: DMOPR

Operations in Baffin Bay and Arctic waters east of longitude 141°W are handled by the office of:

Commander, Maritime Command  
Department of National Defence  
F.M.O.  
Halifax, Nova Scotia B3K 2X0  
Telex: 019-21789

Operations in Arctic waters west of longitude 141°W are handled by the office of:

Commander, Maritime Forces Pacific  
Department of National Defence  
F.M.O.  
Victoria, British Columbia V0S 1B0  
Telex: 049-7410

Operations on-shore north of 60°N are handled by the office of:

Commander, Northern Region Headquarters  
Evans Block  
P.O. Box 6666  
Yellowknife, N.W.T.  
X1A 2R3

#### **Search and Rescue**

The Department of National Defence is responsible for the co-ordination of search and rescue (SAR) operations in Canada.

The Canadian area of responsibility is divided into four SAR areas as listed below:

#### **Edmonton SAR**

This area includes the three Prairie Provinces, all of the Northwest Territories mainland and Arctic Islands, the western half of Hudson Bay, and Baffin Island north of 70°N latitude.

The contact is:

Rescue Coordination Centre  
Canadian Forces Base Edmonton  
Lancaster Park, Alberta  
T0A 2H0  
Telephone: (403) 973-8402, 8403

#### **Victoria SAR**

This area includes British Columbia, Canadian waters off the west coast, the Yukon Territory and the Beaufort Sea south of 70°N and west of 135°W.

The contact is:

Rescue Coordination Centre  
Maritime Forces Pacific Headquarters  
FMO Victoria, B.C.  
V0S 1B0

Telephone: (604) 388-1543, Vancouver (604) 732-4141  
Telex: 049-7410

#### **Halifax SAR**

This area includes Quebec east of 70°W, the Maritime Provinces, Labrador, Canadian waters off the east coast, Foxe Basin, Hudson Strait and Baffin Island south of 70°N.

The contact is:

Rescue Coordination Centre  
Maritime Command Headquarters  
FMO Halifax, N.S.  
B3K 2X0

Telephone: (902) 426-4730, 4735  
Telex: 019-21533

#### **Trenton SAR**

This area includes all Ontario, Quebec west of 70°W, eastern Hudson Bay and James Bay.

The contact is:

Rescue Coordination Centre  
Canadian Forces Base Trenton  
MPO 303  
K0K 1B0

Telephone: (613) 392-2811 Locals 3870, 3875  
Telex: 06-62282



Any of the following may also be contacted in case of emergencies: air traffic control centres, airport control towers, radio stations, marine radio stations, RCMP detachments, provincial and municipal police stations.

The following information is required when reporting an emergency:

- a. Name of caller, phone number, and official connection, e.g., RCMP detachment commander, aircraft owner, etc.;
- b. Assistance required;
- c. Description of aircraft, boat, or whatever craft is involved;
- d. Full details as to the nature of distress or emergency.

## **Detachment of Transport**

### **Aids and Waterways Branch**

This branch includes three divisions which might have a particular interest in offshore exploration programs:

The Vessel Traffic Management and Information Systems Division requires at least 60 days notice before the commencement of any offshore exploration program, in order that they may issue the appropriate notices to mariners. These notices receive worldwide distribution on a weekly basis.

The Marine Aids Division is responsible for identifying any aids to navigation that may be necessary for the program.

The Navigable Waters Protection Act Programs Division requires advance notice of 90 days in any case where drilling involves the territorial sea, in order for approval to be granted under the Navigable Waters Protection Act.

All communications on these matters should be directed to:

Director  
Aids and Waterways Branch  
Canadian Coast Guard  
Transport Canada  
Ottawa, Ontario K1A 0N7

Contact: J.N. Ballinger  
Telephone: (613) 992-2736

In addition, there are a number of departmental officers who may be contacted in the field should the need arise. Regional Offices of the Canadian Coast Guard are located in St. John's Newfoundland, Dartmouth, Nova Scotia, Québec, Quebec, Toronto, Ontario, and Vancouver, British Columbia. With respect to aids to navigation in the Arctic, the officers listed below may be contacted:

District Manager  
Canadian Coast Guard  
Transport Canada  
101 Boulevard Champlain  
Québec, Quebec G1K 4H9

Telephone: (418) 694-3420

(This office handles aids to navigation in the Hudson Bay and Strait area.)

or

District Manager  
Canadian Coast Guard  
Transport Canada  
P.O. Box 5002  
Hay River, Northwest Territories X0E 0R0

Telephone: (403) 874-2406

### **Fleet Systems Branch**

This Branch has major responsibilities in two areas of concern in offshore operations: support of shipping in ice-congested waters, and marine search and rescue.

If operations are being contemplated in areas where ice may be a problem and where ice-breakers or other support may be desired, there should be consultation with the Director, Fleet Systems.

Further information and assistance may be obtained from:

Director  
Fleet Systems Branch  
Canadian Coast Guard  
Transport Canada  
Ottawa, Ontario K1A 0N7

Contact: J.Y. Clarke  
Telephone: (613) 992-4209

#### **Search and Rescue (Marine)**

The Canadian Coast Guard (CCG) of the Department of Transport, Marine Administration is responsible for providing marine search and rescue vessels and the Canadian Coast Guard Marine Controllers who work with Defence personnel in co-ordinating the marine input to search and rescue operations for the Rescue Co-ordination Centres (RCC'S) in Victoria, Trenton and Halifax. CCG personnel completely man the Search and Rescue Emergency Centres in St. John's and Québec. There are no CCG personnel in the RCC Edmonton. The Canadian Coast Guard is responsible for marine accident prevention through boating safety education and regulations and for organizing and managing of the Canadian Marine Rescue Auxiliary. The Commissioner of the Canadian Coast Guard is co-chairman of the Interdepartmental Committee on Search and Rescue (ICSAR) which is responsible for co-ordinating the search and rescue efforts of the departments of National Defence and Transport.

Director, Fleet Systems Branch, as above;

or

Chief, Search and Rescue  
Canadian Coast Guard  
Transport Canada  
Ottawa, Ontario K1A 0N7

Contact: A.F. Mountain  
Telephone: (613) 995-5861

#### **Ship Safety Branch**

This Branch includes the Steamship Inspection Division, the Registry of Shipping, and the Nautical Division. The responsibilities of the Steamship Inspection Division include inspection and certification of ships under the Canada Shipping Act and the Arctic Waters Pollution Prevention Act. This Division also deals with ship safety and pollution matters arising from ship operations, and the application of the Arctic Shipping Pollution Prevention Regulations.

The Nautical Division deals with marine personnel, operational and navigation safety matters. At least 60 days notice is required by this Division when drilling operations are planned for areas lying in or near chartered ship routes so that any necessary authority may be issued.

Further information and assistance may be obtained from:

Director  
Ship Safety Branch  
Canadian Coast Guard  
Transport Canada  
Ottawa, Ontario K1A 0N7

Contact: D.L. Findlay  
Telephone: (613) 992-8892

### **Canadian Coast Guard Emergencies**

This office is responsible for the marine contingency planning function of the Department of Transport and also supplies co-ordination and assistance when a federal response is made to combat a spill of oil or toxic materials into the marine environment. The response is made under the Coast Guard's Arctic Marine Emergency Plan or in the case of international boundary waters, the appropriate Joint International Plan.

Further information and assistance may be obtained from:

Coast Guard Emergencies  
Canadian Coast Guard  
Transport Canada  
Ottawa, Ontario K1A 0N7

Contact: Capt. M.S. Greenham  
Telephone: (613) 992-9743 or 992-9210

### **Coast Guard Casualty Investigations**

This office is responsible for marine accidents investigations, enquiries, and wrecks.

Further information and assistance may be obtained from:

Chief  
Coast Guard Casualty Investigations  
Canadian Coast Guard, Transport Canada  
Ottawa, Ontario K1A 0N7

Contact: Capt. W.A.W. Catinus  
Telephone: (613) 992-4930 or 996-3808

### **Telecommunications & Electronics Branch**

The major responsibilities of this Branch include the provision of maritime mobile communications and the operation and maintenance of electronic aids to navigation. The publication *Radio Aids to Marine Navigation* provides details of all services provided.

The maritime mobile communications function includes a "Safety Service" of weather, ice and navigation broadcasts and the monitoring of designated frequencies for distress, urgency and safety purposes. It also includes a public correspondence service for the transmission and reception of ship-shore radiotelegrams and, where practicable, for ship-shore marine telephone calls.

Further information and assistance may be obtained from:

Director  
Telecommunications and Electronics Branch  
Canadian Coast Guard  
Transport Canada  
Ottawa, Ontario K1A 0N7

Contact: B.B. Borodchak  
Telephone: (613) 996-3621

### **Department of Communications**

#### **Telecommunication Regulatory Service**

The responsibilities of this agency include the development of technical standards, the selection and co-ordination of radio frequencies, and the licensing of all classes of radio station except broadcasting stations.

An operator planning to use radio-communications in his off-shore activities should make application for licensing of any radio station in Canada or on board any Canadian vessel involved at least six weeks before the proposed in-service date of the communication facility. Details as to the licensing requirements and the necessary application forms may be obtained from the following addresses:

In Ottawa:

Director  
Operations Branch  
Telecommunication Regulatory Service  
Department of Communications  
300 Slater Street  
Ottawa, Ontario K1A 0C8  
Telephone: (613) 992-9642



Companies in western Canada may contact:

Regional Director  
Pacific Region  
Department of Communications  
325 Granville Street, Room 300  
Vancouver, British Columbia V6C 1S5  
Telephone: (604) 666-1469

Regional Director  
Central Region  
Department of Communications  
200-386 Broadway Ave.  
Winnipeg, Manitoba R3C 3Y9  
Telephone: (204) 949-4395

District Manager  
Department of Communications  
Government of Canada Bldg.  
820-220-4th Avenue, S.E.  
P.O. Box 2905  
Calgary, Alberta T2P 2M7  
Telephone: (403) 231-4203

District Manager  
Department of Communications  
400 Baker Center  
10025-106th Street  
Edmonton, Alberta T5J 1G6  
Telephone: (403) 425-5614

District Manager  
Department of Communications  
202-11117-100 Street  
Grande Prairie, Alberta T8V 2N2  
Telephone: (403) 532-3533

Companies in northern Canada may contact:

District Manager  
Department of Communications  
P.O. Box 540  
Fort Smith, Northwest Territories X0E 0P0  
Telephone: (403) 872-2187

District Manager  
Department of Communications  
Polaris Building  
201-4133-4th Avenue  
Whitehorse, Yukon Territory Y1A 1H8  
Telephone: (403) 667-5102

District Manager  
Department of Communications  
P.O. Box 2700  
Yellowknife, Northwest Territories X1A 2R1  
Telephone: (403) 873-3568

Companies in Central Canada (Ontario/Quebec)  
may contact:

Regional Director  
Ontario Region  
Department of Communications  
9th Floor, 55 St. Clair Avenue East  
Toronto, Ontario M4T 1M2  
Telephone: (416) 996-6289

Regional Director  
Quebec Region  
Department of Communications  
19th Floor, 2085 Union Street  
Montreal, Quebec H3A 2C3  
Telephone: (514) 283-5682

Companies in eastern Canada may contact:

Regional Director  
Department of Communications  
7th Floor, Terminal Plaza Building  
1222 Main Street  
Moncton, New Brunswick E1C 8P9  
Telephone: (506) 858-2025

## **National Research Council of Canada (NRCC)**

### **Canada Centre for Space Science**

Operators planning offshore activities in the Hudson Bay region must inform this agency of the National Research Council well in advance since scientific sounding rockets are launched from time to time from the NRCC Churchill Research Range. Information is requested well in advance to permit the co-ordination of activities:

Head of Operations  
Canada Centre for Space Science  
National Research Council of Canada  
100 Sussex Dr.  
Ottawa, Ontario K1A 0R6

Contact: B.L. Wetter  
Telephone: (613) 993-5836  
Telex: 053-3715

Rockets are also launched from time to time from rocket launch facilities at Cape Parry, Northwest Territories. Operators planning exploration work in the Arctic Islands are urged to co-ordinate their activities with the National Research Council of Canada.

## **Department of National Revenue**

### **Customs and Excise**

The Headquarters Operations Directorate administers that portion of the Canada Shipping Act that relates to the coastal trade. In this connection, any company importing ships or specialized plants and equipment for exploration work on Canada's seacoasts and among the Arctic Islands may obtain information, assistance and such other contacts as may be necessary in Customs and Excises from:

Director General  
International Traffic Programs Division  
Revenue Canada  
Customs and Excise  
Ottawa, Ontario K1A 0L5

Contact: E.D. Warren  
Telephone: (613) 992-0693

## **Canada Employment and Immigration Commission**

### **Canada Immigration Division**

Director  
Policy Liaison  
Recruitment and Selection Branch  
Canada Employment and Immigration Commission  
Ottawa, Ontario

Contact: C.W. Lloyd  
Telephone: (613) 995-3497

The Winnipeg and Edmonton offices of the Canada Employment and Immigration Commission can answer any queries regarding entry into the Northwest Territories. The Vancouver office can respond to queries for entry into the Yukon Territory.

At Tuktoyaktuk, a local RCMP officer is also a representative for Employment and Immigration and can clear entry into Canada via Tuktoyaktuk.

At Inuvik, the Manager, Canada Employment Centre, can be contacted by telephone if prior arrangements are necessary. There is no representative in Aklavik: in the event that a seismic crew prefers to land at Aklavik, arrangements must be made with the Inuvik representative.

# Appendix II

## Directives

The following directives have been sent to all permittees and lessees.

### **Expenditures Relating to Processing and Interpretation of Geophysical Data Acquired on Canada Lands**

"An information letter was distributed to all Permittees and Lessees advising operators that as from January 1, 1974, expenditures incurred in computer processing and the interpretation of Geophysical Data acquired in the course of exploration activities involving Canada Lands will not be considered eligible for approval as allowable expenditures unless such processing and interpretation has been carried out in Canada.

After January 1, 1974, an operator submitting a claim pursuant to the Canada Oil and Gas Land Regulations, for allowable expenditures involving geophysical operations undertaken on Canada Lands must identify on his statement of expenditures the name of the company or companies involved together with the location of: (a) the computer facilities utilized in the processing of the geophysical data; and (b) the offices wherein interpretation of the geophysical data was undertaken. Expenditures incurred for computer processing must be separately identified and not included as part of the costs incurred for interpretation.

Further in this regard, the processing of geophysical data undertaken on board non-Canadian seismic ships will be considered to be work undertaken outside Canada and not eligible for approval as allowable expenditures.

[Signed]  
Director  
Northern Non-Renewable Resources Branch  
Department of Indian Affairs and Northern  
Development

### **Transfer of Interest — Canada Lands**

"The Canada Oil and Gas Land Regulations stipulate that no transfer of an oil and gas permit or lease shall pass any interest in a permit or lease until the transfer is registered in accordance with the Regulations, which registration must be approved by the Chief. Please be advised that one of the considerations for the approval of the registration of a transfer of any interest in a permit or lease will be that all agreements or an executive summary relating to such transfer of interest have been deposited with the Chief.

All permittees are requested, therefore, to arrange to forward a copy of each current agreement, or an executive summary, to the federal agency concerned at their earliest convenience. In future such agreements should be deposited with the Chief of the appropriate federal agency at the time they are made.

The confidentiality of documents relating to these agreements will of course be maintained until permission to release them is given by the Companies involved.

[Signed]  
Director  
Northern Non-Renewable Resources Branch



### **Importation and Operation of Foreign Vessels**

"The importation and operation of vessels coastwise or between Canadian and foreign ports are subject to the Customs Act, the Canada Shipping Act, and Coastwise and Foreign Shipping Regulations and the Customs Tariff. These acts and regulations, *Inter Alia*, are administered by the Customs Programs Branch of the Department of National Revenue.

A company wishing to import ships or specialized plant and equipment for exploration work off Canada's seacoasts is requested to make application well in advance of the proposed commencement date of any programme. In order to ensure that the application is processed properly, this department should be advised at least ninety days before the commencement of the programme. This lead time of ninety days is needed to determine the suitability of Canadian-flag vessels declared available to fulfill the purposes respecting which temporary entry is sought.

Each application must state the area of operation and the approximate time span, and contain a description of the salient features of the energy source equipment proposed for the particular operation. Information should also be supplied in respect of all other essential criteria required, including bunker and stores capacity, accommodation, clear deck space, size of instrumentation room, electrical energy additional to vessel's normal operation needs and possible draft restrictions.

Any additional information, assistance and other contacts as may be necessary in Customs and Excise may be obtained from:

Director  
International Traffic Programs Directorate  
Department of National Revenue  
Customs and Excise  
Ottawa, Ontario  
K1A 0L5

Telephone: (613) 992-0693"

### **Metric Conversion**

"To: All Permittees and Lessees  
All Oil and Gas Operators  
Canadian Petroleum Association  
Independent Petroleum Association of Canada  
Canadian Association of Oil Well Drilling Contractors

### **"Metric Conversion**

The Metric Conversion Plan Sector 4.02, as approved by the Metric Conversion Committee and the Petroleum and Natural Gas Industry, became operational in SI on 79-01-01.

The Departments of INA and EMR wish to advise that drilling authorities and other reporting forms were issued in SI units as of 79-01-01, and that after that date departmental data are compiled only in these units. Please consult the 3rd Edition of the Supplementary Metric Practice Guide for the correct usage of terms and abbreviations. This publication is available from the Canadian Petroleum Association in Calgary.

The following table indicates the appropriate units and sensitivities that the Departments will require for various drilling and production data.

Item	Reporting SI Unit	Required Sensitivities
Hole size	mm	10 mm (tens of units)
Pressure	kPa	10 kPa (tens of units)
Casing diameters	mm	1 mm (units)
Density	kg/m <sup>3</sup>	1 kg/m <sup>3</sup> (units)
Lease and Permit areas	ha	1 ha (units)
Volume of water, oil and other liquids (15°C)	m <sup>3</sup>	0.1 m <sup>3</sup> (tenths)
Gas volumes (15°C and 101.325 kPa)	10 <sup>3</sup> m <sup>3</sup>	0.1 10 <sup>3</sup> m <sup>3</sup> (tenths)
Depths & short distances	m	0.1 m (tenths)
Distances	km	0.1 km (tenths)
Oil royalty calculations	m <sup>3</sup>	0.01 m <sup>3</sup> (hundredths)
Amount of cement	t	0.01 t (hundredths)

Any questions regarding these matters may be referred to Mr. S.A. Kanik, Northern Program Metric Co-ordinator at (819) 997-9444, and to Mr. F. Lepine, RMB Metric Co-ordinator at (613) 995-9351."

## Addendum for 3D Surveys

### Reporting Requirements for Operators of 3D Seismic Surveys

Geophysical reports in triplicate must be submitted for all geophysical programs performed on Canada Lands, submission to be made when data becomes available to the operator, or within one year as proposed in Bill C-48 (Canada Oil and Gas Act). Because of the special nature of 3D surveys, additional information is required.

The Geophysical Report for a 3D survey must contain the information described below. If any of the following information does not exist, will not become available, or is not applicable to the survey in question, this should be specifically stated in the report under the appropriate heading.

- 1 An operations report, as is required for all geophysical surveys, but with special emphasis on survey techniques. In the case of marine programs the methods used for tracking the cable should be described.
- 2 A processing report, as is required for all geophysical surveys, but with special emphasis on 3D velocity and migration procedures and statics derivation.
- 3 An interpretation report discussing the results of the data analysis with illustrations as necessary. All maps made in the course of the interpretation are required.
- 4 Data
  - (a) Shot point maps.
  - (b) Copies of the fully processed grid seismic lines. Not all lines must be submitted but a line spacing of not greater than 500m. is required as well as all lines which tie with wells.
  - (c) All cross-lines created.
  - (d) All crooked lines created.
  - (e) Paper copies of all horizontal slice seismic sections including those with special display options. (i.e. phase and amplitude)
  - (f) *One copy* of the horizontal time slice movie film RMS velocity information.

The Northern Non-Renewable Resources Branch, Department of Indian Affairs and Northern Development, is a member of the Federal-Provincial Committee on Energy Statistics and the Mines Ministers Subcommittee on Oil and Gas Statistics and together with the four Western Provinces and Statistics Canada has standardized all its oil and gas reporting forms. This standardization has removed duplication among government agencies and more importantly, industry can now complete all oil and gas reporting forms from the Western Provinces and the Yukon and Northwest Territories on electronic data processing equipment without change to programs.

Form No.	Form Title
IAN 52-90-1**	Application for a Drilling Authority
IAN 52-90-2	Well Completion Data
IAN 52-90-3**	Application to Amend a Drilling Authority
IAN 52-90-4**	Application to Change a Well Name
IAN 52-90-5**	Application to Abandon a Well or Suspend Drilling
IAN 52-90-6**	Application to Alter Condition of a Well
IAN 52-90-7	Work-over Report No.
IAN 52-90-8	Application to Commingle Production before Measurement
IAN 52-90-9	Data for Back Pressure Test on Natural Gas Wells-Monograph 7 Method
IAN 52-90-10	Data for Back Pressure Test on Natural Gas Wells-Vitter's Method
IAN 52-90-11	M.P.R. — Oil Calculations
IAN 52-90-12	New Oil Well Report
IAN 52-90-13	New Gas Well Report
IAN 52-90-17	New Service Well Report
IAN 52-90-18	Monthly Water Flood Operations Report
IAN 52-90-20	Monthly Water Receipts and Disposal of Fluids Report
IAN 52-90-23	Geologic Surface Survey & Air-photo Analysis — Expenditures
IAN 52-90-24	Land Geophysical Operations — Expenditures

IAN 52-90-25	Marine Geophysical Programs — Expenditures
IAN 52-90-26	Drilling & Structure Test Drilling Expenditures
IAN 52-90-27	Participation Programs — Expenditures
IAN 52-90-28	Geophysical — Seismic, Aero-magnetometer, Gravity Survey — Participation Program Operators
IAN 52-90-29	Research Program, Environmental Studies — Participation Program Operators
IAN 52-90-30	Geological Surveys, Photogeological, Mapping and Analyses — Participation Program Operators
IAN 52-91**	Notice of Commencement of Exploratory Work
IAN 52-91-1**	Notice of Commencement of Research and Development Work
IAN 52-92	Application for Authority to Drill Structure Test Hole
IAN 52-93	Report on Abandonment of Structure Test Hole
IAN 52-83	Grouping Notice
IAN 52-103**	Application for Oil and Gas Lease
IAN 51-183	Monthly Accident Summary

All forms to be completed by operator.

\*\*To be completed in triplicate; all other forms to be completed in duplicate.

All forms, except IAN 52-83, IAN 52-90-23 to IAN 52-90-27, IAN 52-91, IAN 52-91-1, and 51-103, are submitted to the Regional Oil and Gas Conservation Engineer, Yellowknife, Northwest Territories.

Forms IAN 52-83, 52-90-23 to 52-90-27 and 52-103 are submitted to the Northern Non-Renewable Resources Branch, Ottawa, Ontario K1A 0H4.



Forms IAND 52-91 and 52-91-1 should be submitted to the Oil and Gas Exploratory Operations Section — P.O. Box 2638, Postal Station 'M', Calgary, Alberta T2P 3C1.

The following forms have been issued pursuant to the Canada Oil and Gas Land Regulations and Canada Oil and Gas Drilling Regulations. These forms are to be completed when applicable during the production stage of oil and gas wells, and refinery operations.

Form No.	Form Title
IAND 52-116-1	Monthly Production Report
IAND 52-116-2	Monthly Disposition and Crown Royalty Statement
IAND 52-116-3	Monthly Gas Gathering Statement
DBS 6511-38	Monthly Oil Pipeline Gathering Operations Statement
IAND 52-116-5	Monthly Crude Oil and Condensate Purchaser's Statement
IAND 52-116-6	Monthly Gas Plant Statement
DBS 6511-37	Monthly Natural Gas Distributors Statement
IAND 52-116-8	Monthly Gas Processing Plant Products Statement
IAND 52-116-9	Monthly Liquified Petroleum Gas Purchaser's Statement
IAND 52-116-10	Monthly Refinery Operations Report
IAND 52-116-11	Monthly Gas Injection Operations Report
IAND 52-116-12	Statement of Nomination and Estimated Requirement of Crude Oil, Condensate and Pentanes Plus
IAND 52-116-13	Monthly Sulphur Plant Operations Report

All forms to be completed by operator.

Forms 6511-37 and 6511-38 are completed by the operator in triplicate. The first two copies are to be forwarded to the Northern Non-Renewable Resources Branch in Ottawa, and the third to the Regional Oil and Gas Conservation Engineer, Yellowknife, Northwest Territories.

The other forms listed above are completed in duplicate. The original is submitted to the Northern Non-Renewable Resources Branch in Ottawa and one copy to the appropriate Regional Oil and Gas Conservation Engineer, Yellowknife, Northwest Territories.

All the above forms have been converted to SI units and distributed to industry. The use of SI units became mandatory as of January 1, 1979.

### 1 Arctic Stable Platform

The Arctic Stable Platform lies between the Precambrian Shield to the south and the Franklinian geosyncline to the north and west. The area is underlain by thin, gently dipping, relatively undisturbed Lower Paleozoic carbonates that overlie the craton and thicken northward from the Shield. The Platform is divided into several individual basins, Foxe Basin being the one farthest to the east.

### 2 Franklinian Geosyncline (Arctic Fold Belt)

The limits of Paleozoic deformation define the division between the Franklinian Geosyncline and the Arctic Stable Platform to the south and east. The area was the site of continuous sedimentation from Cambrian to Upper Devonian time. Two depositional belts are recognized; a miogeosynclinal belt extending from Banks Island to northern Greenland, and a eugeosynclinal belt exposed only on Axel Heiberg and Ellesmere Islands. Thick carbonates and clastics constitute potential reservoirs. Strata were folded in the Ellesmerian orogeny of Late Devonian or Early Carboniferous time and these folded strata also constitute the "basement" underlying the Sverdrup Basin.

### 3 Sverdrup Basin

A major angular unconformity marks the base of the Sverdrup Basin, a successor basin with a stratigraphic sequence of Lower Pennsylvanian to Tertiary strata overlying the folded Paleozoic rocks of the Franklinian Geosyncline. The structural and depositional axis of the Sverdrup Basin strikes northeast from Banks Island to northern Ellesmere Island. The thickness of sediments in the basin is in excess of 7 600 m along this axis. The sediments, which are interrupted by a number of unconformities, thin from the axis to form an elongate basin. Sediment thickness and facies indicate that the present south and east limits of the basin are close to the original depositional limits. Tertiary strata of the Arctic Coastal Plain overlap the northern and western margins. Evaporites of late Paleozoic age form piercement structures in the axial zone. Upper Cretaceous and older sediments are intruded by igneous sills and dykes of varying thickness, mostly in the eastern half of the basin. The Eureka orogeny, in late Cretaceous and early Tertiary time, produced folding and faulting throughout the basin; deformation was accompanied by emplacement or reactivation of piercement bodies. Intensity of deformation increases towards the northeast margin of the basin. Thick, sandy sequences of Jurassic and Triassic age contain the major hydrocarbon reserves.

### 4 Arctic Coastal Plain

The north and west margins of the Sverdrup Basin, both on land and offshore, are covered by thick relatively undisturbed Tertiary and Pleistocene clastics. Beds dip gently toward, and thicken on, the continental shelf and slope. In this area the continental shelf is approximately 160 km wide. The waters covering the shelf offshore from the Mackenzie Delta are called the Beaufort Sea. The continental slope, here, is between 600 and 3 000 m water depth. The deep Arctic Ocean, termed the Canada Basin, forms an abyssal plain seaward of the slope. The Tertiary and Mesozoic are considered to have the best potential, offshore, for oil and gas. Permanent ice cover and a short drilling season have hindered or made costly the drilling in the offshore regions.

## **5 Baffin Bay-Davis Strait Basin**

The Baffin Bay-Davis Strait Basin lies entirely offshore. Several theories to explain the origin of the basin have been advanced: a widely accepted one involves continental drift by which Greenland and the Baffin land mass spread apart about a pivotal point located somewhere to the northwest. Geophysical surveys have demonstrated that the basin is underlain by an oceanic crust, that there is no midbasin ridge, and that as much as 7 600 m of sediment cover the floor. Sediments thin to zero in nearshore areas and over the Davis Strait Sill. Rocks cropping out around the basin margins are predominantly Precambrian. Major centres of deposition are the Thule Basin off Greenland, the Lancaster Delta, the Home Bay Delta and the Cumberland Delta. Lancaster Sound and Jones Sound are structurally controlled grabens in which thick deltaic clastics accumulated. A major Tertiary drainage system transported sediment to the basin from a source area to the west. The large volume of geologically young sediments and the presence of favourable trapping conditions for hydrocarbons give the Baffin Bay-Davis Strait area a high hydrocarbon potential.

## **6 Banks Basin**

The Banks Basin occupies the central and west-central part of Banks Island and the adjacent coastal plains. Tertiary and Cretaceous clastics overlie mainly Lower and Middle Devonian sediments over much of the area. Proterozoic rocks of the Minto Arch occur at the southernmost tip. The sediments of the Banks Basin have been sparsely drilled and the presence of thick Tertiary and Mesozoic sediments and the reefal facies of the Devonian-Silurian carbonates give the area a moderate potential for hydrocarbon accumulations.

## **7 Mackenzie-Beaufort Basin**

The Mackenzie Delta-Beaufort Sea petroleum province is made up of a thick section containing productive Cretaceous and Tertiary sands. The Mackenzie Delta, the southern portion of the Mackenzie-Beaufort Basin, is bounded by the Romanzof uplift to the southwest, the Richardson Mountains to the south, the Eskimo Lakes Arch to the southeast and the Arctic Ocean to the north. The Beaufort Sea is one of several marginal embayments that occur as indentations in the coastline of the Arctic Ocean. The coastal plain, which lies adjacent to the Beaufort Sea, is laterally continuous with the continental shelf and is considered as the onshore, exposed extensions of the Beaufort Sea shelf. The Beaufort Sea petroleum province is contiguous with the Yukon and Mackenzie coastal plains and the Banks coastal plain.

Growth faults extend seaward from the Mackenzie Delta across the coastal plain. Shale diapirs form large, mostly offshore structures. Potential reservoir rocks, which include deltaic and marine sandstones are interbedded and continuous with organic-rich shales.

## **8 Interior Plains**

a) Great Slave Plain — The Great Slave Plain encompasses an area extending westward from Great Slave Lake to the Liard Plateau and Mackenzie Mountains. Underlying strata are mainly of Devonian age, covered in part by remnants of a thick Cretaceous sequence. The total thickness of sediment ranges from zero in the east to more than 3 000 m in the west. Gas reservoirs are found in porous dolomites and limestones of Middle Devonian age.

b) Great Bear Plain — The Great Bear Plain consists of Lower and Upper Cretaceous sediments partially on a bedrock of Ordovician to Devonian age. The total thickness of the sediments wedges from zero in the east to more than 1 800 m in the west along the eastern edge of the Franklin Mountains.



c) Anderson Plain — The Anderson Plain lies east of the Mackenzie Delta. Cretaceous beds cover much of the Plain and lie unconformably on Lower and Middle Paleozoic beds. Sediments more than 2 400 m thick occur in a southwest-northeast trend through the wells C.P.O.G. Kugaluk N-02 and Elf Horton River G-02. Hydrocarbon shows have been encountered in the Cretaceous deposits.

d) Mackenzie Plain — The Mackenzie Plain lies between the Franklin and Mackenzie Mountains. Cretaceous beds lie unconformably on Lower and Middle Paleozoic beds. Sediments range in thickness from 1 200 m to 2 700 m. Oil is produced in the Mackenzie Plain at Norman Wells, from the Devonian Kee Scarp formation. Additional hydrocarbon shows have been encountered in the Cretaceous and Silurian.

e) Peel Plain — The Peel Plain lies northeast of the Peel Plateau and northwest of the Mackenzie Plain. It is covered by Cretaceous and Jurassic sediments which overlie Paleozoic carbonates and shales. The sediments are similar to those of the Mackenzie Plain and range in thickness from more than 4 200 m in the southwest to 2 400 m in the northeast. Hydrocarbon shows have been encountered in the Lower Devonian.

#### **9 Liard Plateau and Range**

The Liard Plateau and Range lie west of the southern portion of the Great Slave Plain and northwest of the Fort Nelson Lowland.

A thin Cretaceous cover lies unconformably on Paleozoic beds. The Beaver River and Pointed Mountain fields produce or have produced gas from thrust dolomites of the Nahanni formation of Middle Devonian Age. Production in the now depleted Beaver River field in the Yukon was also from large faulted anticlines containing Mississippian sands.

#### **10 Eagle Plain**

The Eagle Plain basin is contained between the Ogilvie and Richardson Mountains. Sediments approach 6 100 m in thickness, of which about 3 000 m are late Paleozoic to Mesozoic in age, the remainder being Cenozoic. The basin has been tectonically deformed. Hydrocarbon shows have been encountered in Mississippian, Devonian and Ordovician beds.

#### **11 Peel Plateau**

The Peel Plateau is bounded on the northeast and the east by the Peel Plateau Plain, on the south by the Mackenzie Mountains, and on the west by the Richardson Mountains. The Plateau is covered by Tertiary and Cretaceous clastics unconformably overlying Paleozoic shales and carbonates. The sediments range in thickness from 3 000 m in the east to 6 100 m in the west. Shows of hydrocarbons have been encountered in Cretaceous and Middle Devonian strata.

#### **12 Old Crow Basin**

The Old Crow Basin is a relatively unexplored intermontane basin covering an area of about 6 200 km<sup>2</sup> centered at about latitude 68°N and longitude 140°W. Geophysical data indicate a thickness of from 500 to 1 500 m of Mesozoic and Tertiary clastics overlying as much as 3 000 m of Upper Devonian to Permo-Carboniferous sediments. The Old Crow Basin as it now exists was formed by the Laramide orogeny in Tertiary time.

#### **13 Whitehorse Basin**

The Whitehorse Basin lies at the northern end of the Central Cordilleran Geosyncline. It is about 240 km long and 110 km wide and contains up to 4 600 m of sediments ranging in age from early Cretaceous to Late Triassic.

A selected bibliography of the geology of the Yukon and Northwest Territories is provided in Appendix V.

A wide variety of reports and papers applicable to geological provinces or basins in northern Canada are available; a majority are Geological Survey of Canada (GSC) publications or are in proceedings and memoirs of various societies. A listing of all GSC reports may be found in the *Index to Publications 1959 - 1974* by P.J. Griffen, published by the GSC in 1976. The following is a list of the more important of these papers.

Aitken, J.D., and Glass D.J. (Editors)  
1973: GAC — CSPG Proceedings of the Symposium on the Geology of the Canadian Arctic. Geol. Assoc. Can. Soc. Pet. Geol.

McCrossan, R.G. (Editor)  
1973: Future Petroleum Provinces of Canada; Can. Soc. Pet. Geol. Memoir 1.

Wren, A.E. and Cruz R.B. (Editors)  
1974: Proceedings of the 1973 National Convention. Canadian Society of Exploration Geophysicists.

Yorath, C.J., Parker, E.R. and Glass, D.J. (Editors)  
1975: Canada's Continental Margins and Offshore Petroleum Exploration. Can. Soc. Pet. Memoir 4.

For a complete list of oil industry technical reports released from confidential status, the reader should refer to the DINA publication *Technical Reports Available for Inspection — 1921-1978*.

Important references not found in the preceding publications are listed below.

### **Northwest Territories — Mainland**

Bily, C. and Dick, J.W.C.  
1974: Naturally Occurring Gas Hydrates in the Mackenzie Delta, N.W.T. Bull. Can. Pet. Geol. Vol. 22, No. 3, pp. 340-353.

Cote, R.P., Rector, R., Lerand, M.  
1974: Gulf Describes Geology of the Parsons Lake Gas find, Bull. Can. Pet. Geol. Vol. 22 No. 1, pp. 72-78.

Crickmay, C.H.  
1970: Ramparts, Beavertail and Other Devonian Formations. Bull. Can. Pet. Geol. Vol. 18, No. 1, pp. 67-79.

Law, J.  
1971: Regional Devonian Geology and Oil and Gas Possibilities, Upper MacKenzie River Area. Bull. Can. Pet. Geol. Vol. 19, No. 2, pp. 437-484.

Meijer-Drees, N.C.  
1975: Geology of the Lower Paleozoic Formations in the Subsurface of the Fort Simpson Area, District of Mackenzie, GSC Pap. 74-40.

Norford B.S. and Macqueen R.W. 1975  
Lower Paleozoic Franklein Mountain and Mount Kindle Formations, District of MacKenzie — This Type Section and Regional Development G.S.C. paper 74-34, 37 pp.

Smith, M.W.  
1976: Permafrost in the MacKenzie Delta. GSC Pap. 75-28.

Vopni, L.K., and Lerbekmo J.F.  
1972: The Horn Plateau Formation: A Middle Devonian Coral Reef Northwest Territories. Bull. Can. Pet. Geol. Vol. 20, No. 3, pp. 498-548.

Young, F.G.  
1975: Upper Cretaceous Stratigraphy, Yukon Coastal Plain and Northwestern Mackenzie Delta. GSC Bull. 249.

Young, F.G., Myhr, D.W., and Yorath, C.J.  
1976: Geology of the Beaufort — Mackenzie Basin. GSC Pap. 76-11.

### **Eagle Plain and Northern Yukon**

Bamber, E.W. and Waterhouse, J.B.  
1971: Carboniferous and Permian Stratigraphy and Paleontology, Northern Yukon Territory. Bull. Can. Pet. Geol. Vol. 19, No. 1, pp. 29-249.

Lenz, A.C.  
1972: Ordovician to Devonian History of Northern Yukon and Adjacent District of MacKenzie. Bull. Can. Pet. Geol. Vol. 20, No. 2, pp. 321-361

Miall, A.D.  
1973: Regional Geology of Northern Yukon. Bull. Can. Pet. Geol. Vol. 21, No. 1, pp. 81-116.

Norris, A.W.  
1967: Devonian and Northern Yukon Territory and Adjacent District of Mackenzie Int. Symp. Devonian System. Alberta Soc. Pet. Geol.

Arctic Islands  
Balkwill, H.R.  
1978: Evolution of Sverdrup Basin, Arctic Canada. Bull. Am. Assoc. Pet. Geol. Vol. 62, No. 6, pp. 1004-1028.

Embry, A.F., and Klován, J.E.  
1976: The Middle — Upper Devonian Clastic Wedge of the Franklinian Geosyncline. Bull. Can. Pet. Geol. Vol. 24, No. 4, pp. 485-639.

Frebold, H.  
1975: Jurassic Faunas of the Canadian Arctic. GSC Bull. 243.

Klován, J.E. and Embry, A.F. III  
1971: Upper Devonian Stratigraphy, Northeastern Banks Island. Bull. Can. Pet. Geol. Vol. 19, No. 4, pp. 705-729.

Plauchut, B.P.  
1971: Geology of the Sverdrup Basin. Bull. Can. Pet. Geol. Vol. 19, No. 3, pp. 659-679.

Plauchut, B.P. and Jutard, G.G.  
1976: Cretaceous and Tertiary Stratigraphy, Banks and Eglinton Islands and Anderson Plains. Bull. Can. Pet. Geol. Vol. 24, No. 3, pp. 321-371.

Snowdon, L.R. and Roy, K.J.  
1975: Regional Organic Metamorphism in the Mesozoic Strata of the Sverdrup Basin. Bull. Can. Pet. Geol. Vol. 23, No. 1, pp. 131-172.

Stuart-Smith, J.H. and Wennekers, J.H.N.  
1977: Geology and Hydrocarbon Discoveries of Canadian Arctic Islands. Am. Assoc. Pet. Geol. Bull. Vol. 61, No. 1, pp. 1-28.

#### **Arctic Coastal Plain and Continental Shelf**

Sobczak, L.W.  
1975: Gravity and Deep Structure of the Continental Margin of Banks Island and Mackenzie Delta. Can. J. Earth Sci. Vol. 12, pp. 248-395.

#### **Hudson Bay Basin and Lowlands**

Stanford B.V. and Norris, A.W.  
1975: Devonian Stratigraphy of the Hudson Platform: Part I, Stratigraphy and Economic Geology. GSC Memoir 379.

#### **Foxe Basin and Baffin Bay**

Keen, C.E. et al.  
1972: Geophysical Studies in Baffin Bay and Some Tectonic Implications. Can. J. Earth Sci. Vol. 9, No. 3.

Keen, C.E. and Barrett D.L.  
1973: Structural Characteristics of Some Sedimentary Basins in Northern Baffin Bay. Can. J. Earth Sci. Vol. 10, No. 7, pp. 1267-1278.

Trettin, H.P.  
1975: Investigations of Lower Paleozoic Geology, Foxe Basin, Northeastern Melville Peninsula and Parts of Northwestern and Central Baffin Island. GSC Bull. 251.

















Indian and Northern  
Affairs Canada

Affaires indiennes  
et du Nord Canada

# Oil and Gas Activities 1981

Government  
Publications

C.A1

IA 61

-Φ32



Canada



## ERRATA

### Oil and Gas Activities 1981

#### Reads:

#### Should Read:

- |  |  |
|--|--|
| <p>P.6 Preface (5th paragraph)<br/>           . . . The Department retains responsibility . . .</p>  | <p>. . . Other units of the Department of Indian and Northern Affairs retain responsibility . . .</p>  |
| <p>P. 6 Preface (6th paragraph)<br/>           The Northern Oil and Gas Liaison and Co-ordination Directorate serves as the principal point of liaison between the Department and COGLA . . .</p>  | <p>The Northern Oil and Gas Lands Co-ordination Directorate serves as the principal point of liaison between other units of the Department and COGLA . . .</p>   |
| <p>P. 6 Preface (7th paragraph)<br/>           . . . Assistant Deputy Minister (Northern Affairs) — G.N. Faulkner . . .<br/>           . . .<br/>           . . . Canada Oil and Gas Lands Administration — Administrator, M. Taschereau<br/>           . . .<br/>           . . .</p> | <p>. . . Assistant Deputy Minister (Northern Affairs Program) — G.N. Faulkner<br/>           Director-General, Northern Resources and Economic Planning Branch — R.D. Glass . . .<br/>           . . . Canada Oil and Gas Lands Administration — Administrator — M.E. Taschereau<br/>           Deputy Administrator, Operations — D.G. Crosby<br/>           Subdivisions of the Operations Group responsible for management of current oil and gas rights are: . . .</p> |
| <p>P. 34 Revenues (3rd paragraph)<br/>           . . . the result of the issuance of a single exploration agreement to Petro-Canada in 1979.</p>   | <p>. . . the result of the issuance of a single exploration agreement to Dome Petroleum Ltd. in 1979.</p>  |
| <p>P. 40 Offshore<br/>           Western Arctic (1st paragraph)<br/>           Kopanoar 2144 was re-entered and completed . . .</p>  | <p>Kopanoar 2 I-44 was re-entered and completed . . .</p>  |
| <p>P. 48 Figure 13<br/>           1 Paramount et al Cameron J76</p>  | <p>1 Paramount et al Cameron J-76</p>  |
| <p>P. 59 Figure 19<br/>           — Proposed Norman Wells Pipeline<br/>           Fort Laird<br/>           Fort Norman</p>  | <p>● ● Interprovincial Pipe Line (NW) Ltd.<br/>           Fort Liard<br/>           Location is 80 kilometres south of Norman Wells on the Mackenzie River.</p>  |

# Oil and Gas Activities 1981

(Edition No. 18)

**Report on  
the Activities in 1981 of  
the Oil and Gas Industry in  
the Yukon Territory and  
Northwest Territories**

Compiled by Oil and Gas Liaison and Co-ordination  
Directorate  
Northern Non-Renewable Resources

©Published under the authority of the  
Hon. John Munro, Minister  
of Indian and Northern Affairs Canada,  
Ottawa, 1982  
QS-8313-000-EE-A1  
Catalogue No. R71-6/1981E  
ISBN 0-662-12217-5

Cette publication peut aussi être obtenue en  
français: *Pétrole et gaz activités 1981*







# Table of Contents

<b>6</b>	<b>Preface</b>	<b>53</b>	<b>Net Cash Expenditures by Industry in 1981</b>
<b>8</b>	<b>Summary</b>	<b>56</b>	<b>Production, Processing and Refining</b>
<b>11</b>	<b>Oil and Gas Discoveries and Reserves</b>	56	Norman Wells Oil Field
12	Geological Provinces North of 60 - Oil and Gas Discoveries and Recoveries	56	Pointed Mountain Gas Field
21	Report of the Reserves Committee of the Canadian Petroleum Association - 1981	56	Kotaneelee Gas Field
23	Summary of Potential Oil and Natural Gas Resources	<b>57</b>	<b>Pipelines and Development Projects</b>
<b>25</b>	<b>Land Administration</b>	57	Arctic Liquefied Natural Gas (LNG) Pilot Project (APP)
<b>30</b>	<b>Acts and Regulations</b>	58	Norman Wells Pipeline
30	Canada Oil and Gas Act	<b>58</b>	<b>Surveys and Studies</b>
30	Canada Oil and Gas Land Regulations	58	Geophysical Surveys
33	Canada Oil and Gas Geophysical Regulations	58	Research Programs
33	Canada Oil and Gas Pipeline Regulations	58	APOA and COOSRA
33	Canada Oil and Gas Production Regulations	60	Lancaster Sound Regional Study
<b>34</b>	<b>Revenues</b>	61	Land Use Planning
<b>40</b>	<b>Exploration, Discoveries and Drilling Operations</b>	61	Beaufort Region Environmental Impact Statement
40	Exploration	<b>62</b>	<b>Appendix I</b>
40	Geological and Geophysical Surveys		Sources of Information
40	Land Seismic Surveys	<b>78</b>	<b>Appendix II</b>
40	Marine Seismic Surveys		Directives
40	Drilling	<b>81</b>	<b>Appendix III</b>
40	Offshore		Reporting Forms
46	Arctic Islands	<b>83</b>	<b>Appendix IV</b>
46	Mainland		Summaries of the Geological Provinces
46	Mackenzie Delta	<b>86</b>	<b>Appendix V</b>
46	Yukon		Selected Bibliography
46	Discoveries		
47	1982 Forecast		

# Tables and Illustrations

## Tables

11	Table 1	Area and Volume of Sediments
22	Table 2	Canadian Petroleum Association Estimate of Reserves
23	Table 3	Summary of Oil and Natural Gas Resources of Canada - 1982
25	Table 4	Number of Issued Permits and Leases with Relevant Extent as of December 31, 1981
35	Table 5	Gross Revenue, Oil and Gas (Calendar Year) 1975 to 1981
37	Table 6	Gross Revenue, Oil and Gas (Fiscal Year) 1974-75 to 1980-81
43	Table 7	1973-1981 Exploration Survey Statistics
46	Table 8	Wells Abandoned or Completed in 1981 (Drilling Statistics)
53	Table 9	Net Cash Expenditures by Industry in 1980 (Final)
54	Table 10	Net Cash Expenditures by Industry in 1981 (Preliminary)

## Illustrations

		Oil and Gas Fields and Discoveries (map) centrefold
9	Figure 1	Geological Basins (map)
26	Figure 2	Area Held Under Oil and Gas Permit
27	Figure 3	Area under Lease - by Year
28	Figure 4	Land Holdings, 1981 (map)
29	Figure 5	Permit Terms and Work Requirement Zones
31	Figure 6	Permit Terms and Deposit Requirements - per Acre
32	Figure 7	Disposal of Oil and Gas Rights (flow diagram)
36	Figure 8	Gross Revenue - Oil and Gas (Calendar Year)
38	Figure 9	Gross Revenue - Oil and Gas (Fiscal Year)
39	Figure 10	Value of Work Bonus Tenders - Oil and Gas
41	Figure 11	Exploratory Activity — geological crew months — land seismic crew months
42	Figure 12	Exploration Activity — seismic line kilometres
48	Figure 13	Wells Completed or Abandoned in 1981 Southern Northwest Territories and Yukon Territory (map)

49	Figure 14	Wells Completed or Abandoned in 1981 Mackenzie Delta — Beaufort Sea (map)
50	Figure 15	Wells Completed or Abandoned in 1981 Arctic Islands (map)
51	Figure 16	Wells Drilled
52	Figure 17	Depth Drilled
55	Figure 18	Oil and Gas Exploration Expenditures Submitted for Work Credits
59	Figure 19	Northern Pipelines (map)
60	Figure 20	Eastern Arctic Marine Environmental Study (EAMES) (map)

## Photographs

Frontispiece	False-colour infrared satellite photograph of the Mackenzie Delta
7 Photo 1	Gulf et al E. Tarsiut N-33 caisson-retained artificial island well in the Beaufort Sea. (Courtesy Gulf Canada Resources Inc.)
33 Photo 2	Dome/Canmar Explorer drillship in the Beaufort Sea. (Courtesy Dome Canada)
34 Photo 3	The Panarctic AIEG PRC PPC Cisco B-66 gas and oil discovery drilled from an ice platform off Loughheed Island in the Sverdrup Basin. (Courtesy Panarctic Oils Ltd.)
40 Photo 4	Esso Alerk P-23 artificial island in the Beaufort Sea. (Courtesy Esso Resources Canada Ltd.)
56 Photo 5	Esso Issungnak 2 o-61 artificial island well in the Beaufort Sea. (Courtesy Esso Resources Canada Ltd.)



# Preface

The federal government's policies for northern development emanate from the 1972 policy framework "Canada's North 1970-1980" which established objectives and priorities for Canada's north. These objectives and priorities were directed toward improving the quality of northern life, protecting the northern environment as an essential element of northern economic and social development, encouraging a viable economic development, and promoting meaningful progress towards territorial self-government. A number of modifications and elaborations on this framework have occurred since 1972 through ministerial statements which reflect some of the important changes which have occurred both in the north and nationally since then.

The National Energy Program (NEP) was announced by the Government in October, 1980. With regard to the north, the NEP encourages increased exploration, in keeping with our "need to know" the location, size and economic feasibility of resources. Exploration is encouraged by a Petroleum Incentives Program, under which grants covering qualified exploration expenses will be provided to industry. The central focus is the achievement of oil self-sufficiency by 1990. The NEP endorses the principle that particular care should be paid to environmental matters when commercial energy projects are undertaken.

In late 1981, the Ministers of Indian Affairs and Northern Development and Energy, Mines and Resources established the Canada Oil and Gas Lands Administration (COGLA).

COGLA was established to implement the Canada Oil and Gas Act and bring together the administration of oil and gas exploration and development activities on all Canada Lands north and south of 60°. The petroleum resource management staffs from both Departments were amalgamated into the one organization. The Administration serves as the principal point of contact for the oil and gas industry concerning exploration activities on Canada Lands.

Establishment of COGLA has not altered the Minister's responsibilities for oil and gas development. The Department retains responsibility for coordination of policy planning, the determination of socio-economic benefits for residents of the territories, the establishment of environmental operating conditions and the management of land and freshwater and arctic water resources under other legislation.

The Northern Oil and Gas Liaison and Coordination Directorate serves as the principal point of liaison between the Department and COGLA and to ensure that northern policy and northern concerns are reflected in the administration of northern oil and gas rights and associated oil and gas activities.

As of March 1, 1982 the Minister and departmental officers responsible for the management of oil and gas resources in the Northwest Territories, Yukon Territory and the northern offshore areas were:

Minister – The Honourable John C. Munro  
Deputy Minister – Paul M. Tellier  
Assistant Deputy Minister (Northern Affairs) –  
G.N. Faulkner,  
Director, Northern Non-Renewable Resources –  
H.W. Woodward.

**Oil and Gas Policy Co-ordination Division**  
Chief – P. Sullivan

**Oil and Gas Operations Co-ordination Division**  
Chief – S.A. Kanik

**Canada Oil and Gas Lands Administration**  
Administrator – M. Taschereau



Gulf et al E. Tarsiut N-44 artificial caisson-retained island well in the Beaufort Sea.

The Oil and Gas Land Management Branch administers the Government's proprietary interest in oil and gas rights on Canada Lands, grants exploration and production licences, maintains a registry of oil and gas rights and monitors royalty and other revenue functions directly resulting from oil and gas activities.

Director-General – R.J. Harrison

The Resource Evaluation Branch is responsible for the assessment of the oil and gas potential of Canada Lands and for economic and geological appraisals of individual parcels of land. The Branch assesses exploratory programs, records and maintains technical data from exploration programs and keeps a library of exploration reports.

Director-General – D.F. Sherwin

The Engineering and Control Branch is responsible for regulating oil and gas activities for the safety of personnel and conservation of oil and gas resources. It sets safety standards, enforces good oil field practices, sound environmental practices and prevents waste.

Director-General – L.V. Brandon

# Summary

In the area of Canada north of 60°, several new discoveries and extensions to previous discoveries of oil, gas or oil and gas were made during 1981. In the Sverdrup Basin (offshore) three potential oil and gas discoveries were made. In the Beaufort Sea, one new and two extensions to previous oil and gas discoveries were made.

Bill C-48, the *Canada Oil and Gas Act*, a major element in the government's National Energy Program that was tabled in the House of Commons in December 1980, was passed by the House in December 1981 and proclaimed in March, 1982. It lays down explicit requirements and conditions for the acquisition of oil and gas land rights and for the exploration of oil and gas resources in Canada's frontier regions. It introduces a new system of grants to replace the existing permit and lease arrangement. Although its terms may reduce the extent and number of land holdings at first, it is expected to lead in the long run to a more orderly assessment of northern resources.

The Canada Oil and Gas Lands Administration was established in late 1981 to implement the *Canada Oil and Gas Act* and the amended *Oil and Gas Production and Conservation Act*. As well, it brings the administration of oil and gas exploration and development activities on all Canada Lands north and south of 60° together. The responsibilities of the Ministers of Indian Affairs and Northern Development and of Energy, Mines and Resources have, however, not changed.

Under the authority of the *Canada Oil and Gas Land Regulations*, nine exploration agreements, covering about 7 million hectares in the southern Territories and Mackenzie Valley areas were concluded with PetroCanada in 1981. The number of leases increased and more than half of the area held under exploratory rights is in the form of special renewal permits. Both of these factors indicate industry's uncertainty as to the terms and conditions of the new exploration agreements to be negotiated under the Canada Oil and Gas Act.

The Department of Indian Affairs and Northern Development has worked jointly with the Department of Energy, Mines and Resources during the past several years to draft suitable up-to-date regulations on a variety of oil and gas subjects. These include the *Canada Oil and Gas Geophysical Regulations*, the *Canada Oil and Gas Pipeline Regulations* and the *Canada Oil and Gas Production Regulations*.

Revenues for the calendar year 1981 were slightly greater than those for 1980, but revenues for the fiscal year 1980-81 showed a slight decrease of about \$1 million. The cumulative work-bonus to the end of the calendar year was approximately \$59 million, an increase of \$100,000 over 1978, due to one single exploration agreement issued in 1979.

Very few geological surveys were carried out during 1981 and those that were were limited to short programs in the central Yukon Territory and in the Arctic Islands. Land seismic surveys remained at approximately the same levels and were carried out on the Mainland, in the Mackenzie Delta and in the Arctic Islands. Marine seismic surveys totalling approximately 13 100 km, 12 000 km in the Beaufort Sea and 1 100 km in the Baffin Bay-Davis Strait area.

Drilling activity decreased, with wells being concentrated in the Beaufort Sea and the Sverdrup Basin. In the Beaufort Sea, artificially created islands, as well as drillships, were used for drilling, while in the Arctic Islands ice platforms were used for offshore drilling. Six discoveries or extensions to existing fields resulted from the 1981 drilling operations. In all, 13 wells were drilled with a total depth of 38 990 metres.

It is expected that the general activity in 1982 will be similar to that of 1981, with work mainly in the Arctic Islands, the Mackenzie River and Delta and the Beaufort Sea. The first of a series of wells to be drilled in the enhanced recovery project at Norman Wells, will be drilled in late 1982.

During 1981, net cash expenditures by industry on oil and gas exploration North of 60° increased substantially over the amount spent in 1980.



**Figure 1**  
**Geological Provinces**



Reserves of oil, as estimated by the Canadian Petroleum Association for all Canada, declined significantly in 1981. Gas reserves continued to increase. Only five per cent of 1981 oil production was replaced, while 210 per cent of the gas production was replaced.

Both oil and gas production at Norman Wells were higher in 1981. Production of gas decreased at the Pointed Mountain Gas Field. In the Yukon, although the Kotaneelee field came on stream as a result of the completion of the gas gathering and gas dehydration systems in 1977, the field was shut-in in 1981 due to lack of markets.

With the increased output anticipated at Norman Wells, a pipeline is planned from there to Northern Alberta. Interprovincial Pipelines has received approval from the National Energy Board to build this 300 mm line commencing in the winter of 1983-84.

The Arctic Liquefied Natural Gas (LNG) Pilot Project (APP) application to the Board for permission and authority to transport natural gas from the Arctic Islands by tanker in liquified form (LNG) is under consideration.

The Canadian Offshore Oil Research Association (COOSRA), formed to further understanding of oil spills and the best methods of coping with them, has taken over responsibility for a number of projects formerly handled by APOA.

The program of Eastern Arctic Marine Environmental Studies (EAMES) set up in 1977 was completed in 1981. The aim is to provide data from areas of the Eastern Arctic, notably the east coast of Baffin island, on the advisability of granting drilling authorities in the region. It is the first program to consider the character and needs of the total ecology of a region rather than just specific, isolated, scattered areas within it. It involves both industry and federal departments, with industry bearing the larger share of the cost.

The Lancaster Sound Regional Study, initiated in 1977, produced a draft green paper in 1981, and the final green paper is expected in mid-1982. The work is being carried out by an interdisciplinary working group of representatives from five federal departments to consider optimum future uses of the land and sea resources of the area. Native residents of the area are included on the working group.

A northern land use planning process was approved in 1981. Consultation is under way with other federal departments, territorial governments, native organizations and other interest groups concerning the organization, structure and process to implement the planning programs.

Dome Petroleum initiated work on behalf of itself, Esso and Gulf, on an Environmental Impact Statement (EIS) on the Beaufort Region development proposals.

# Oil and Gas Discoveries and Reserves

The area of Canada north of 60° covers approximately 3 800 000 km<sup>2</sup>, of which nearly one-third is underlain by sedimentary rocks. A comparison of the area and volume of sediments in the Western Provinces, the Yukon and the Northwest Territories (including the Arctic Islands) is given in Table 1. (North of 60° area and volume are for Canada Lands; that is, lands under the jurisdiction of the government of Canada.)

**Table 1**  
Area and Volume of Sediments

Regions	Total Area km <sup>2</sup>	Volume of Sediments km <sup>3</sup>
Manitoba & Saskatchewan	570 000	688 000
Alberta	582 000	1 390 000
British Columbia	359 000	1 242 000
Yukon & Northwest Territories Mainland*	1 402 000	1 755 000
Arctic Archipelago**	1 670 000	5 314 000
	4 583 000	10 389 000

\* Includes Beaufort Sea area, but excludes all Arctic Stable Platform.

\*\*Includes the Arctic Stable Platform and all offshore areas except Beaufort Sea.

For convenient reference, the area north of 60° has been divided into 13 major geological provinces and a number of sub-provinces as shown in Figure 1. More details of these geological provinces are given in Appendix IV, *Summaries of the Geological Provinces*. A short list of relevant references to the geology of the area is given in Appendix V. The discoveries map (at centre fold) shows the locations of all oil and gas fields, including the 1981 discoveries.

The distribution of oil and gas discoveries and recoveries to the end of 1981, and the potential for future discoveries in the various geological provinces, are outlined in the following pages.



## Geological Provinces North of 60° — Oil and Gas Discoveries and Recoveries

(\*indicates discovery/recovery in 1981)

(DST — Drillstem Test; FT — Flow Test; AOF — Absolute Open Flow; CCT — Closed Chamber Test; OTS — Oil to Surface)

Well Name	Location	Well Status	Reserve Status	Horizon	Lithology	Spud Date	Completion Date	Potential
1. Arctic Stable Platform — only four wells have been drilled to date, all unsuccessful.								
2. Franklinian Geosyncline — significant quantities of light gravity crude oil have been recovered from Middle Devonian carbonates on Cameron Island.								
<b>Cameron Island</b>								
Panarctic et al Bent Horn N-72	N-72-76-30-103-30	Potential Oil & Gas Well	Oil Show	Blue Fiord	Carbonate	73-11-24	74-04-06	79.5 m <sup>3</sup> /d test
Panarctic et al Bent Horn F-72A	F-72-76-30-103-30	Potential Oil & Gas Well	Oil Show	Blue Fiord	Carbonate	75-05-21	75-12-19	70.8 m <sup>3</sup> /d oil DST
Panarctic et al W. Bent Horn A-02	A-02-76-30-104-00	Potential Oil & Gas Well	Oil Discovery	Blue Fiord	Carbonate	76-05-06	76-08-01	Max. 1256 m <sup>3</sup> /d production test

3. Sverdrup Basin — ten gas fields have been discovered to date. Recoveries of crude oil have been recorded from Ellesmere and Thor Islands, and in the Lougheed Island area.

### Gas Discoveries

<b>Melville Island</b>								
Panarctic Drake Point N-67	N-67-76-30-108-30	Abandoned	Gas Discovery	Jurassic	Sandstone	69-04-14	69-09-02	Abandoned after blow-out
Panarctic Drake Point L-67	L-67-76-30-108-30	Potential Dual Gas	Gas Dev.	Jurassic Bjorne	Sandstone	69-09-28	70-02-28	DST 282 10 <sup>3</sup> m <sup>3</sup> /d (Jurassic)
Panarctic et al Drake F-16	F-16-76-30-108-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	72-05-10	72-06-16	AOF 7466 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Drake B-44	B-44-76-30-108-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	72-09-23	72-10-22	DST 155 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Drake D-68	D-68-76-30-108-30	Potential Gas	Gas. Dev.	Jurassic Bjorne	Sandstone Sandstone	73-06-07	74-03-25	DST 245 10 <sup>3</sup> m <sup>3</sup> /d DST 1.1 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Drake E-78	E-78-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	74-05-02	74-05-27	DST 135 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Drake D-73	D-73-76-30-108-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	75-04-23	75-05-10	DST 228 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Drake F-76	F-76-76-30-108-00	Suspended Gas	Gas Dev.	Jurassic	Sandstone	78-03-02	78-04-30	AOF 2169 10 <sup>3</sup> m <sup>3</sup> /d @ 88.0 kPa

Panarctic et al East Drake I-55	I-55-76- 30-107-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	75-03-06	75-04-16	AOF 1634 10 <sup>3</sup> m <sup>3</sup> /d critical flow proved
Panarctic et al W. Hecla N-52	N-52-76- 30-110-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	74-03-05	74-04-15	AOF 1465 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Hecla F-62	F-62-76- 30-110-00	Potential Gas	Gas Discovery	Jurassic	Sandstone	72-11-11	72-12-12	AOF 2705 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Hecla I-69	I-69-76- 20-110-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	73-02-22	73-04-11	DST 220 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al E. Hecla C-32	C-32-76- 30-110-00	Potential Gas	Gas Discovery	Jurassic	Sandstone	75-11-07	75-12-10	DST 239 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al W. Hecla P-62	P-62-76- 30-110-30	Potential Gas	Gas Dev.	Jurassic	Sandstone	76-01-07	76-02-22	DST 149 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al W. Hecla M-25	M-25-76- 30-111-00	Potential Gas	Gas Dev.	Jurassic	Sandstone	76-03-14	76-04-18	DST 152 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Roche Pt. O-43	O-43-75- 50-109-30	Abandoned Gas	Gas Discovery	Triassic	Sandstone	78-01-18	78-04-18	DST 5.6 10 <sup>3</sup> m <sup>3</sup> /d
<b>Thor Island</b>								
Panarctic et al Thor H-28	H-28-78- 10-103-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	73-02-28	73-05-10	Flow test to 1549 10 <sup>3</sup> m <sup>3</sup> /d
<b>Ellef Ringnes Island</b>								
Panarctic et al Kristoffer Bay B-06	B-06-78- 20-102-30	Potential Gas	Gas Discovery	Heiberg	Sandstone	71-11-09	72-03-17	DST 281 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al Jackson Bay G-16A	G-16-78- 10-101-00	Potential Gas	Gas Discovery	Heiberg	Sandstone	76-03-16	76-04-30	DST 207 10 <sup>3</sup> m <sup>3</sup> /d
<b>King Christian Island</b>								
Panarctic King Christian D-18	D-18-77- 50-101-00	Abandoned	Gas Discovery	Heiberg	Sandstone	70-10-14	71-01-25	Abandoned after blowout
Panarctic King Christian D-18A	D-18-77- 50-101-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	70-11-26	71-03-15	AOF 7438 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic et al King Christian N-06	N-06-77- 50-101-00	Potential Gas	Gas Dev.	Heiberg	Sandstone	71-05-13	71-09-20	AOF 9579 10 <sup>3</sup> m <sup>3</sup> /d
Dome Arctic Ventures Wallis K-62	K-62-78- 00-102-00	Potential Gas	Gas Discovery	Heiberg	Sandstone	72-11-27	73-02-21	DST 350 10 <sup>3</sup> m <sup>3</sup> /d

**Offshore Sverdrup**

Panarctic AIEG Whitefish H-63	H-63-77- 20-106-30	Potential Gas	Gas Discovery	Awingak Heiberg	Sandstone	79-02-18	79-05-21	DST 228 10 <sup>3</sup> m <sup>3</sup> /d
Panarctic AIEG Whitefish 2H-63	H-63-77- 20-106-30	Potential Gas	Gas Dev.	Isachsen Awingak U. Heiberg L. Heiberg	Sandstone	79-12-03	80-05-15	

**Crude Oil Recoveries****Ellesmere Island**

Panarctic Romulus C-42	C-42-80- 00-84-00	Suspended	Oil & Gas Show	Jurassic Schei Point Bjorne	Sandstone	72-01-29	72-07-25	Area has potential
---------------------------	----------------------	-----------	-------------------	--------------------------------------	-----------	----------	----------	-----------------------

**Thor Island**

Panarctic et al Thor P-38	P-38-78- 10-103-00	Suspended	Oil Show	Heiberg	Sandstone	72-04-06	72-05-10	Thin Oil leg on water
------------------------------	-----------------------	-----------	----------	---------	-----------	----------	----------	--------------------------

**Offshore Sverdrup**

Panarctic AIEG Dome Char G-07	G-07-77- 40-99-30	Potential Gas	Oil and Gas Discovery	Awingak U. Heiberg	Sandstone	80-02-06	80-04-22	
Panarctic AIEG Dome Balaena D-58	D-58-77- 40-100-00	Potential Oil	Oil Discovery	Isachsen	Sandstone	80-02-06	80-04-27	
*Panarctic et al Cisco I-66	I-66-77- 30-106-00	Potential Oil	Oil & Gas Discovery	Awingak King Christian	Sandstone	81-02-01	81-05-04	
*Panarctic AIEG MacLean I-72	I-72-77- 40-103-30	Potential Gas and Oil	Oil & Gas Discovery	Heiberg Group	Sandstone	81-01-27	81-04-27	
*Panarctic et al Skate B-80	B-80-77- 50-104-30	Potential Gas and Oil	Oil and Gas Discovery	Heiberg Group	Sandstone	81-01-20	81-04-04	

---

4. Arctic Coastal Plain — no successful wells to date.

---

5. Banks Basin — no hydrocarbon discoveries to date, but the area is considered to have a moderate potential for hydrocarbon accumulation.

---

6. Baffin Bay-Davis Strait — this “province” lies entirely offshore and to date has been explored by only two wildcat wells. It contains several areas that hold promise for future hydrocarbon discoveries: the Thule Basin off Greenland, Lancaster Delta, Home Bay Delta, Cumberland Delta, Lancaster Sound and Jones Sound.

Aquitaine et al Hekja O-71	O-71-62- 20-62-45	Potential Gas	Gas Discovery	Tertiary	Sandstone	79-07-29	80-10-07	
-------------------------------	----------------------	------------------	------------------	----------	-----------	----------	----------	--

---

7. Mackenzie-Beaufort Basin — oil and gas have been found in Paleozoic carbonates and in Lower Cretaceous and Tertiary sands.



## Crude Oil Discoveries

<b>Mackenzie Delta — Tuktoyaktuk Peninsula</b>								
IOE Atkinson H-25	H-25-69-50-131-45	Abandoned	Potential Oil Well	Lower Cretaceous	Sandstone	69-12-14	70-02-26	500.9 m <sup>3</sup> /d calc. 24.3° API
IOE Mayogiak J-17	J-17-69-30-132-45	Abandoned	Potential Oil Well	Devonian & Lower Cretaceous	Carbonate & Sandstone	71-04-03	71-08-06	1163.8 m <sup>3</sup> /d 33.6° API
Imp. Ivik J-26	J-26-69-40-134-15	Suspended	Potential Oil & Gas Well	Tertiary	Sandstone	72-04-08	72-09-30	849.8 m <sup>3</sup> /d calc. 24° API
Imp. Ivik K-54	K-54-69-40-134-15	Abandoned	Potential Oil	Tertiary	Sandstone	73-03-30	73-06-08	131.9 m <sup>3</sup> /d calc. 24° API
Imp Adgo F-28	F-28-69-30-135-45	Plugged & Abandoned	Oil & Gas	Tertiary	Sandstone	73-12-28	74-03-19	238.5 m <sup>3</sup> /d 17.5° API
Imp Adgo J-27	J-27-69-30-135-45	Abandoned	Gas	Tertiary	Sandstone	79-04-05	79-08-07	
Shell Kugpiik O-13	O-13-69-20-135-15	Suspended	Oil	Lower Cretaceous	Sandstone	73-03-26	73-09-30	461.1 m <sup>3</sup> /d 50° API
Shell Kumak J-06	J-06-69-20-135-00	Suspended	Oil	Tertiary	Sandstone	73-11-24	74-05-01	795 m <sup>3</sup> /d 27.1° & 31.3° API
Shell Niglintgak M-19	M-19-69-20-135-15	Suspended	Oil & Gas	Tertiary	Sandstone	74-06-01	75-01-25	O.T.S. 18.8 – 32° API
Sun et al Garry P-04	P-04-69-30-135-30	Suspended	Oil & Gas	Tertiary	Sandstone	75-08-25	76-01-05	O.T.S. DST
Gulf Mobil Kamik D-48	D-48-69-00-133-15	Suspended	Oil & Gas	Lower Cretaceous	Sandstone	75-12-23	76-04-04	O.T.S. DST
<b>Beaufort Sea</b>								
Dome Hunt Nektoralik K-59	K-59-70-30-136-00	Abandoned	Oil & Gas	Tertiary	Sandstone	77-08-08	77-10-17	O.T.S. DST
Dome Hunt Kopanoar M-13	M-13-70-30-135-00	Abandoned	Oil	Tertiary	Sandstone	76-09-27	78-10-16	O.T.S. DST
Esso et al Issungnak O-61	O-61-70-10-134-00	Abandoned Oil and Gas Discovery	Oil and Gas	Tertiary	Sandstone	80-02-06	80-07-08	
Dome Gulf Tarsiut A-25	A-25-70-00-136-15	Suspended	Oil and Gas	Tertiary	Sandstone	78-10-18	80-07-30	
Esso Gulf et al Issungnak 2 O-61	O-61-70-10-134-00	Abandoned Oil & Gas Discovery	Oil & Gas	Tertiary	Sandstone	80-10-02	81-08-13	

Dome Gulf Hunt Kopanoar 2 I-44	I-44-70- 30-135-00	Abandoned Oil Discovery	Oil & Gas	Tertiary	Sandstone	80-07-11	81-10-29	
Dome Hunt Gulf Koakoak O-22	O-22-70- 30-134-00	Abandoned Oil & Gas Discovery	Oil & Gas	Tertiary	Sandstone	79-11-06	81-10-30	

## Gas Discoveries

### Mackenzie Delta — Tuktoyaktuk Peninsula

Gulf Mobil Parsons F-09	F-09-69- 00-133-30	Suspended	Gas & Condensate	Lower Cretaceous	Sandstone	71-01-20	72-04-19	DST 485 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons N-10	N-10-69- 00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	73-02-14	73-05-29	FT 958 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons L-37	L-37-69- 00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	76-12-26	77-04-02	DST 642 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons P-41	P-41-69- 00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	76-12-29	77-04-05	DST 190 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons A-44	A-44-69- 00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	75-04-09	75-07-22	DST 423 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons P-53	P-53-69- 00-133-30	Suspended	Gas & Condensate	Lower Cretaceous	Sandstone	73-12-22	74-04-09	DST 234 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons O-27	O-27-69- 00-133-30	Suspended	Gas	Cretaceous	Sandstone	74-03-23	74-08-30	DST 77 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons L-43	L-43-69- 00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	75-12-10	76-03-04	DST 781 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons N-17	N-17-69- 00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	75-12-18	76-04-13	DST 634 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Parsons D-20	D-20-69- 00-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	76-04-21	76-11-22	DST 578 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Imp. Shell Reinder F-36	F-36-69- 10-134-30	Suspended	Gas	Tertiary	Sandstone	73-03-13	73-06-05	DST 138 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Siku C-11	C-11-69- 10-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	75-12-26	76-03-22	DST 874 10 <sup>3</sup> m <sup>3</sup> /d Calc.
Gulf Mobil Siku A-12	A-12-69- 10-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	76-04-14	76-07-26	DST 1 325 10 <sup>3</sup> m <sup>3</sup> /d (est)
Gulf Mobil Siku E-21	E-21-69- 10-133-30	Suspended	Gas	Lower Cretaceous	Sandstone	77-04-17	77-06-21	DST 815 10 <sup>3</sup> m <sup>3</sup> /d

Gulf Imp. Shell Titalik K-26	K-26-69- 10-135-00	Abandoned	Gas	Tertiary	Sandstone	72-10-17	73-02-20	DST 396 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Ya Ya A-28	A-28-69- 20-134-30	Suspended	Gas	Tertiary	Sandstone	74-02-28	74-07-06	DST 319 10 <sup>3</sup> m <sup>3</sup> /d
Gulf Mobil Ya Ya P-53	P-53-69- 20-134-30	Suspended	Gas	Tertiary	Sandstone	72-12-08	73-03-20	DST 229 10 <sup>3</sup> m <sup>3</sup> /d
IOE Taglu G-33	G-33-69- 30-134-45	Suspended	Gas	Tertiary	Sandstone	71-04-13	71-08-18	DST 809 10 <sup>3</sup> m <sup>3</sup> /d
IOE Taglu C-42	C-42-69- 30-134-45	Suspended	Condensate	Eocene	Sandstone	72-04-30	72-11-18	DST 691 10 <sup>3</sup> m <sup>3</sup> /d Calc.
IOE Taglu W. P-03	P-03-69- 30-135-00	Suspended	Gas	Eocene	Sandstone	71-12-12	72-03-29	178 10 <sup>3</sup> m <sup>3</sup> /d Max. flow rate
IOE Taglu D-43	D-43-69- 30-134-45	Suspended	Gas	Eocene	Sandstone	73-03-23	73-09-11	AOF 854 10 <sup>3</sup> m <sup>3</sup> /d
IOE Mallik L-38	L-38-69- 30-135-00	Abandoned	Potential Oil	Tertiary	Sandstone	71-12-24	72-04-05	CCT/250 m <sup>3</sup> /d calc.
Imp. Taglu H-54	H-54-69- 30-134-45	Suspended	Gas	Tertiary	Sandstone	76-12-02	77-04-05	DST 71 10 <sup>3</sup> m <sup>3</sup> /d
Imp. Netserk F-40	F-40-69- 40-135-45	Suspended	Gas	Tertiary	Sandstone	75-11-08	76-05-09	DST 251 10 <sup>3</sup> m <sup>3</sup> /d
Shell Kumak K-16	K-16-69- 20-135-00	Suspended	Gas	Tertiary	Sandstone	75-02-23	75-07-13	DST 336 10 <sup>3</sup> m <sup>3</sup> /d
Shell Kumak E-58	E-58-69- 30-135-00	Suspended	Gas	Tertiary	Sandstone	77-02-28	77-06-08	DST 482 10 <sup>3</sup> m <sup>3</sup> /d
Shell Niglintgak H-30	H-30-69- 20-135-15	Suspended	Gas	Tertiary	Sandstone	72-10-24	73-04-07	DST 448 10 <sup>3</sup> m <sup>3</sup> /d
Shell Niglintgak B-19	B-19-69- 20-135-15	Suspended	Gas	Tertiary	Sandstone	75-10-18	76-02-22	DST 243 10 <sup>3</sup> m <sup>3</sup> /d
Sun et al Garry P-04	P-04-69- 30-135-30	Suspended	Oil & Gas	Tertiary	Sandstone	75-08-25	76-01-05	DST 491 10 <sup>3</sup> m <sup>3</sup> /d
Sun et al Garry G-07	G-07-69- 30-135-30	Suspended	Gas Dev.	Tertiary	Sandstone	78-02-10	78-05-13	DST 57 m Cond.
Imp. Isserk E-27	E-27-70- 00-134-15	Abandoned Gas	Gas Discovery	Tertiary	Sandstone	77-12-04	78-05-04	—



<b>Beaufort Sea</b> Dome Hunt Nektoralik K-59	K-59-70- 30-136-00	Abandoned	Oil & Gas	Tertiary	Sandstone	77-08-08	77-10-17	—
Dome et al Ukalerk C-50	C-50-70- 10-132-30	Abandoned	Gas	Tertiary	Sandstone	77-07-19	77-10-03	—
Dome Gulf et al Ukalerk 2C-50	C-50-70- 10-132-30	Suspended	Gas	Tertiary	Sandstone	78-07-10	78-10-16	—

## 8. Interior Plains

**Great Slave Plain** — gas pools have been discovered in porous dolomites and limestones of Middle Devonian age.

Briggs Rabbit Lake No. 1	O-16-61- 00-118-45	Potential Gas Well	Gas Discovery	Sulphur Point	Limestone	55-02-04	55-03-30	AOF 57 10 <sup>3</sup> m <sup>3</sup> /d (est)
Briggs Rabbit Lake No. 2	B-07-61- 00-118-45	Potential Gas Well	Gas Discovery	Sulphur Point	Limestone	57-02-09	57-03-14	AOF 170 10 <sup>3</sup> m <sup>3</sup> /d (est)
Home Signal CSP Celibeta No. 2	H-78-60- 10-122-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	59-12-26	60-03-24	AOF 226 10 <sup>3</sup> m <sup>3</sup> /d
H.B. Cameron Hills A-05	A-05-60- 10-117-30	Potential Gas Well	Gas Discovery	Slave Point Sulphur Point	Limestone Dolomite	68-01-28	68-02-24	DST 232 10 <sup>3</sup> m <sup>3</sup> /d
Paramount et al Cameron Hills J-62	J-62-60- 10-117-30	Potential Gas Well	Gas Discovery	Sulphur Point	Limestone	80-02-11	80-03-11	—
Paramount et al Cameron Hills M-31	M-31-60- 10-117-00	Potential Gas Well	Gas Discovery	Keg River	Dolomite	79-04-02	80-07-21	—
H.B. Pan Am S. Island R. M-41	M-41-60- 10-121-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	64-02-03	64-04-23	DST 161 10 <sup>3</sup> m <sup>3</sup> /d
H.B. Amoco S. Island R. M-52	M-52-60- 10-121-00	Abandoned	Gas Discovery	Slave Point	Limestone	73-01-21	73-02-21	DST 37 10 <sup>3</sup> m <sup>3</sup> /d
Pacific Amoco Tathlina N-18	N-18-60- 20-118-00	Potential Gas Well	Gas Discovery	Slave Point	Limestone	73-01-28	73-02-19	DST 51 10 <sup>3</sup> m <sup>3</sup> /d
Shell H.B. Grumbler G-63	G-63-60- 20-115-45	Abandoned	Potential Gas Discovery	Slave Point	Limestone	69-02-14	69-03-16	DST 282 10 <sup>3</sup> m <sup>3</sup> /d
Sun Netla C-07	C-07-60- 50-122-45	Potential Gas Well	Gas Discovery	Sulphur Point	Limestone	61-01-20	61-04-05	AOF 677 10 <sup>3</sup> m <sup>3</sup> /d
Texaco Bovie Lake J-72	J-72-60- 10-122-45	Potential Gas Well	Gas Discovery	Nahanni	Dolomite	70-01-06	70-01-18	DST 74 10 <sup>3</sup> m <sup>3</sup> /d
Union Pan Am Trainor C-39	C-39-60- 20-120-30	Potential Gas Well	Gas Discovery	Sulphur Point	Carbonate	65-01-29	65-03-15	DST 226 10 <sup>3</sup> m <sup>3</sup> /d

**Great Bear Plain** — No discoveries to date

**Mackenzie Plain** — Oil is produced at Norman Wells from the Devonian Kee Scarp formation, and additional hydrocarbon shows have been encountered in the Cretaceous and Silurian age formations of this "province".

## Crude Oil Discoveries

### Norman Wells Oil Field

Northwest Discovery No. 1	P-37-65- 20-126-45	Abandoned	Oil Discovery	Devonian Canol	Fractured Shale	20-04-14	44-08-06	2.0 m <sup>3</sup> /d
Northwest Discovery No. 2	P-37-65- 20-126-45	Abandoned	Oil Discovery	Kee Scarp (Givetian)	Limestone	24-07-01	24-09-12	12.0 m <sup>3</sup> /d

96 additional wells were drilled to develop the field.

**Peel Plain** — No discoveries here as yet, but hydrocarbon shows have been encountered in Lower Devonian formations.

**Anderson Plain** — One gas discovery has been made at Tedji Lake, and several other hydrocarbon shows have been encountered.

Ashland et al Tedji Lake F-24	F-24-67- 50-126-45	Suspended	Gas	Basal Cambrian	Sandstone	74-02-13	74-03-31	DST 127 10 <sup>3</sup> m <sup>3</sup> /d
----------------------------------	-----------------------	-----------	-----	-------------------	-----------	----------	----------	--

9. Liard Plateau and Range — gas was produced in this province at the Beaver River (field) and is being produced at Pointed Mountain field from dolomites of the Nahanni Formation of Middle Devonian age. The Beaver River field (Y.T. portion) produced gas from Mississippian sands. Gas has also been discovered at Kotaneelee and La Biche.

### Northwest Territories

C.P.O.G. et al La Biche F-08	F-08-60- 40-124-30	Suspended	Gas Discovery	Middle Devonian	Argilla- ceous Limestone	71-02-25	71-03-19	DST 82 10 <sup>3</sup> m <sup>3</sup> /d
Pan Am Pointed Mountain G-62	G-62-60- 30-123-45	Gas Well	Gas Dev.	Middle Devonian Carbonate	Dolomite	68-07-09	69-06-23	Flow back 339 10 <sup>3</sup> m <sup>3</sup> /d
Pan Am Pointed Mountain K-45	K-45-60- 30-123-45	Gas Well	Gas Dev.	Middle Devonian Carbonate	Dolomite	67-09-15	68-05-08	AOF 2 130 10 <sup>3</sup> m <sup>3</sup> /d
Pan Am Pointed Mountain O-46	O-46-60- 30-123-45	Gas Well	Gas Dev.	Devonian Nahanni	Dolomite	69-03-29	71-10-02 Extended Standby	AOF 545 10 <sup>3</sup> m <sup>3</sup> /d
Pan Am Pointed Mountain P-53	P-53-60- 30-123-45	Gas Well	Gas Discovery	Devonian Nahanni	Dolomite	66-02-06	67-02-22	AOF 1979 10 <sup>3</sup> m <sup>3</sup> /d
Amoco B-2 Pointed Mountain F-38	F-38-60- 30-123-45	Gas Well	Gas Dev.	Devonian Nahanni	Dolomite	72-08-22	73-10-07	AOF 818 10 <sup>3</sup> m <sup>3</sup> /d
Amoco Pointed Mountain A-55	A-55-60- 30-123-45	Gas Well	Gas Dev.	Devonian Nahanni	Dolomite	74-03-01	74-08-08	Production tested 127 10 <sup>3</sup> m <sup>3</sup> /d
Paramount et al Liard D-29	D-29-60- 30-123-00	Potential Gas Well	Gas Discovery	Arnica	Dolomite	79-01-28	80-07-24	

<b>Yukon Territory</b> Canada Southern et al North Beaver River YT I-27	I-27-60- 10-124-00	Suspended	Extension Test Gas Well	Middle Devonian	Carbonate	63-03-24	64-09-29	AOF 43 10 <sup>3</sup> m <sup>3</sup> /d
Columbia Gas et al Kotaneelee H-38	H-38-60- 10-124-00	Gas Well	Gas Dev.	Middle Devonian	Carbonate	77-04-06	77-10-29	Production tested 592 10 <sup>3</sup> m <sup>3</sup> /d
Columbia et al Kotaneelee YT E-37	E-37-60- 10-124-00	Suspended Gas Well	Gas Dev.	Middle Devonian	Carbonate	78-01-21	78-12-05	
Columbia et al Kotaneelee YT I-48	I-48-60- 10-124-00	Gas Well	Gas Dev.	Nahanni Arnica	Dolomite	79-04-18	80-04-11	AOF 12,931 10 <sup>3</sup> m <sup>3</sup> /d
Pan Am Beaver River YT G-01	G-01-60- 10-124-15	Abandoned Gas Well	Gas Producer	Missis- sippian & Nahanni	Sandstone and Carbonate	68-06-12	69-03-10	AOF 192 10 <sup>3</sup> m <sup>3</sup> /d AOF 1120 10 <sup>3</sup> m <sup>3</sup> /d

10. Eagle Plain — significant hydrocarbon shows have been encountered, but no commercial discoveries have been reported.

Canoe River Chance YT J-19	J-19-66- 10-137-30	Potential Gas & Oil	Oil & Gas Discovery	Carbon- iferous Hart River	Conglom- eratic Sandstone	67-12-14	68-02-17	DST 184 10 <sup>3</sup> m <sup>3</sup> /d
Socony Mobil WM Chance YT G-08	G-08-66- 10-137-30	Potential Oil Well	Oil & Gas Discovery	Cretaceous  Carbon- iferous Hart River	Sandstone  Conglom- eratic Sandstone	64-12-04	65-02-15	DST 93 10 <sup>3</sup> m <sup>3</sup> /d 360 m oil
Socony Mobil WM Birch YT B-34	B-34-66- 10-136-45	Potential Gas Well	Gas Discovery	Carbon- iferous Hart River	Conglom- eratic Sandstone	64-08-04	65-08-06	DST 206 10 <sup>3</sup> m <sup>3</sup> /d
Socony Mobil WM Blackie YT No. 1 M-59	M-59-66- 00-137-00	Potential Gas Well	Gas Discovery	Permian	Conglom- eratic Sandstone	63-12-11	64-03-27	DST 79 10 <sup>3</sup> m <sup>3</sup> /d
WM Chance YT No. 1 M-08	M-08-60- 10-137-30	Potential Gas or Oil Well	Gas & Oil Discovery	Cretaceous Carbon- iferous Hart River	Sandstone Conglom- eratic Sandstone	59-05-30	60-05-25	142 10 <sup>3</sup> m <sup>3</sup> /d 0.5 m <sup>3</sup> /d

11. Peel Plateau — shows of hydrocarbons have been observed.

12. Old Crow Basin — no wells have been drilled to date in this basin.

13. Whitehorse Plain — no wells have been drilled to date in this basin.



## **Report of the Reserves Committee of the Canadian Petroleum Association – 1981**

The Canadian Petroleum Association (CPA) in its 1981 *Reserves* News Release reported a significant drop in conventional oil reserves in the western provinces. Only five percent of 1981 production was replaced. Following 12 consecutive years of decline, remaining reserves at year end were down to the pre-1962 level.

Remaining conventional oil reserves in the established producing areas of Canada (excluding frontier areas) declined 6.7 percent or 63 million cubic metres (393 million barrels) to 868 million cubic metres (5 460 million barrels).

Apart from general criteria for the estimation of established reserves (adopted by industry, the Council of Provincial Energy Ministers and the National Energy Board in 1978), a field must have a certain minimum number of successful wells and the specific area must meet threshold volume requirements before CPA will include any reserves in its estimates.

Under these new guidelines, CPA estimated established oil reserves for the “eastcoast offshore area” for the first time. In including these reserves, CPA made the critical assumption that the anticipated future economics (pricing and revenue sharing) will allow the economic development of these reserves. CPA also cautioned that the actual development and production of these reserves will also depend on the provision of transportation systems needed to deliver production to markets.

CPA’s initial estimate of established reserves for the eastcoast offshore is 175 million cubic metres (1.1 billion barrels).

CPA estimates the combined reserves of conventional crude oil reserves in Canada’s established producing areas and the frontiers at 1 064 million cubic metres (6.7 billion barrels) at the end of 1981. Including pentanes plus, total conventional crude oil and equivalent reserves were estimated to be 1 154 million cubic metres (7.3 billion barrels).

Natural gas reserves continued to climb in the conventional areas and increased four percent to 1 987 million cubic metres (70.5 trillion cubic feet), with 210 percent of annual production being replaced. CPA also reported that 16 percent or 398 billion cubic metres (14 trillion cubic feet) of gas reserves at the end of 1981 were not connected to markets (shut in volumes are actually greater).

Adding frontier area gas reserves, CPA estimated Canada’s total remaining established reserves of marketable natural gas at the end of 1981 to be 2 563 billion cubic metres (91 trillion cubic feet).

**Table 2**

## Canadian Petroleum Association Estimate of Reserve

## Liquid Hydrocarbons

## Remaining Established Reserves North of 60° and Total for Canada

Thousand Cubic Metres

Regions	Remaining Reserves 80-12-31	1980 Net Production	Remaining Reserves at 81-12-31	Net Change <sup>1</sup> in Reserves during 1981
<b>Crude Oil</b>				
Mainland Territories (S. of 68°N)	21 009	160	20 860	– 146
Canada Total Crude Oil	951 228	65 873	1 063 575	112 347
<b>Pentanes Plus</b>				
Mainland Territories (S. of 68°N)	195	—	195	—
Mackenzie Delta-Beaufort Sea	8 302	—	8 302	—
Arctic Islands	4 732	—	4 732	—
Canada Total Pentanes Plus	92 813	5 223	90 541	2 272
Total Crude Oil and Equivalent	1 044 041	71 096	1 154 116	110 075
<b>Propane, Butane &amp; Ethane</b>				
Mainland Territories (S. of 68°N)	1 960	—	305	– 1 655
Canada Total Propane, Butane and Ethane	110 333	6 946	103 252	—
Canada Total Liquid Hydrocarbons	1 154 374	78 042	1 257 368	102 994

## Marketable Natural Gas

## Remaining Established Reserves North of 60° and Total for Canada

(Million Cubic Metres at 101.325 kPa and 15°C)

Regions	Remaining Reserves 80-12-31	1981 Net Production	Remaining Reserves 81-12-31	Net Change <sup>1</sup> in Reserves during 1981
<b>Marketable Natural Gas</b>				
Mainland Territories (S. of 68°N)	15 102	352	11 581	– 3 521
Mackenzie Delta-Beaufort Sea	184 123	—	184 123	—
Arctic Islands	380 551	—	380 551	—
Canada Total — Marketable Natural Gas	2 491 864	67 760	2 562 973	71 109

1. Changes in reserves are due to production, extensions, discoveries, and to revisions to calculated reserves.

1 cubic metre (m<sup>3</sup>) oil = 6.2898 barrels  
1 cubic metre (m<sup>3</sup>) gas = 35.3147 cubic ft.

### Summary of Potential Oil and Natural Gas Resources

The Department of Energy, Mines and Resources has estimated the likelihood of existence of oil and gas resources in the various regions of Canada. These estimates are reproduced in Table 3 and are based on data available in 1982.

**Table 3**

Summary of Potential Oil and Natural Gas Resources – 1982

(Remaining Reserves, Discovered Resources and Undiscovered Potential in Million Cubic Metres and Billions of Barrels)

Region	“High” 95% Probability		Average Expectation		“Low” 5% Probability	
	10 <sup>6</sup> m <sup>3</sup>	Bbbl	10 <sup>6</sup> m <sup>3</sup>	Bbbl	10 <sup>6</sup> m <sup>3</sup>	Bbbl
West Coast Offshore	—	—	48	0.3	111	0.7
Mackenzie Delta-Beaufort Sea	1 002	6.3	1 494	9.4	1 956	12.3
Mainland Territories	16	0.1	95	0.6	715	4.5
Arctic Islands, Basin and Stable Platform	382	2.4	684	4.3	1 208	7.6
Hudson Bay and Northern Lowlands	—	—	127	0.8	556	3.5
Baffin Bay	16	0.1	111	0.7	238	1.5
Labrador Shelf	—	—	79	0.5	191	1.2
East Newfoundland Shelf	795	5.0	1 335	8.4	2 194	13.8
Scotian Shelf and Georges Banks	127	0.8	286	1.8	477	3.0
East Newfoundland Basin	127	0.8	270	1.7	715	4.5
Grand Banks Shelf	—	—	48	0.3	111	0.7
Gulf of St. Lawrence and Misc. Basins	—	—	16	0.1	32	0.2
Western Canada Basin	1 129	7.1	1 367	8.6	1 781	11.2
Total Canada	5 247	33	6 042	38	7 631	48



## Summary of Natural Gas Resources of Canada – 1982

(Remaining Reserves, Discovered Resources and Undiscovered Potential in Billion Cubic Metres and Trillions of Cubic Feet)

Region	“High” 95% Probability		Average Expectation		“Low” 5% Probability	
	10 <sup>9</sup> m <sup>3</sup>	tcf	10 <sup>9</sup> m <sup>3</sup>	tcf	10 <sup>9</sup> m <sup>3</sup>	tcf
West Coast Offshore	39	1.4	265	9.4	761	27
Mackenzie Delta-Beaufort Sea	2 141	76	3 155	112	4 113	146
Mainland Territories	56	2	310	11	1 972	70
Arctic Islands, Basin and Stable Platform	1 493	53	2 451	87	3 860	137
Hudson Bay and Northern Lowlands	—	—	87	3.1	394	14
Baffin Bay	42	1.5	535	19	1 183	42
Labrador Shelf	34	1.2	535	19	1 042	37
East Newfoundland Shelf	172	6.1	290	10.3	532	18.9
Scotian Shelf and Georges Banks	180	6.4	366	13	676	24
East Newfoundland Basin	113	4	366	13	902	32
Grand Banks Shelf	17	0.6	85	3	180	6.4
Gulf of St. Lawrence and Misc. Basins	20	0.7	39	1.4	90	3.2
Western Canada Basin	4 113	146	4 451	158	4 818	171
Total Canada	10 903	387	12 932	459	16 144	573

Note: These columns do not total arithmetically to the Canada totals because individual curves must be summed using a statistical technique.

# Land Administration

Oil and gas holdings during 1981 remained relatively stable. At year-end, 60.4 million hectares (Table 4) were held, a level comparable to the pre-Prudhoe oil and gas holdings in 1967. Nine exploration agreements on lands preferentially selected, under the amendments to the Regulations, by Petro-Canada were the only new rights granted during the year in the southern Territories and central Mackenzie Valley sectors. To facilitate native land claim negotiations, seven of these exploration agreements contain a restriction on access to the lands for exploration purposes until mid-1983. The 7 million hectares granted under these new exploration agreements are approximately equivalent to the rights surrendered from mature oil and gas permits.

The increased number of leases held in 1981 is indicative of industry's uncertainty as to terms and conditions of the new exploration agreements to be negotiated under the Canada Oil and Gas Act. More than half of the area held for exploration purposes during 1981 is in the form of special renewal permits. These discretionary grants were made in consideration of additional exploratory work. The rapidly escalating levels of work requirements for this type of holding provide an appropriate vehicle for the high costs of exploration efforts in the more remote regions of the North. The continuity of such programs to assess the potential for oil and gas reserves is an important element in meeting the objectives of Canada's National Energy Program.

**Table 4**

Number of Issued Exploration Rights (including permits, special renewal permits, exploration agreements) and Leases, with areal extent, as of December 31, 1981.

Area	Exploratory Rights		Leases	
	No.	Area (ha)	No.	Area (ha)
N.W.T. Mainland	110	8 437 703	1 288	2 982 902
Yukon Mainland	45	590 202	188	265 974
Arctic Islands	1 521	31 702 023	612	1 430 406
Arctic Coast Marine	441	14 575 008	141	376 192
Total	2 117	55 304 936	2 229	5 055 474

In addition to a basic royalty of 10% on oil and gas produced, the Act requires a further royalty of 40% of net profits. Holders of most existing rights will be required to convert their holdings to negotiated exploration agreements or provisional leases within a one year transitional period. The replacement rights will bear considerably shorter terms and more stringent work requirements than those existing under the previous regime, in order to accelerate the pace of exploration and development of frontier resources. As well, the Act provides for increased Ministerial authority to demand, as a condition of tenure, provision of goods and services by Canadians and social benefits as well as other considerations relevant to concerns of northerners. The Act also establishes an Environmental Studies Revolving Fund to facilitate the exploration process in areas under the Minister's jurisdiction, and for ways and means of determining the extent of Canadian ownership of oil and gas.

Figure 2  
**Area Held Under Oil and Gas Permit**  
 Yukon Territory and Northwest Territories

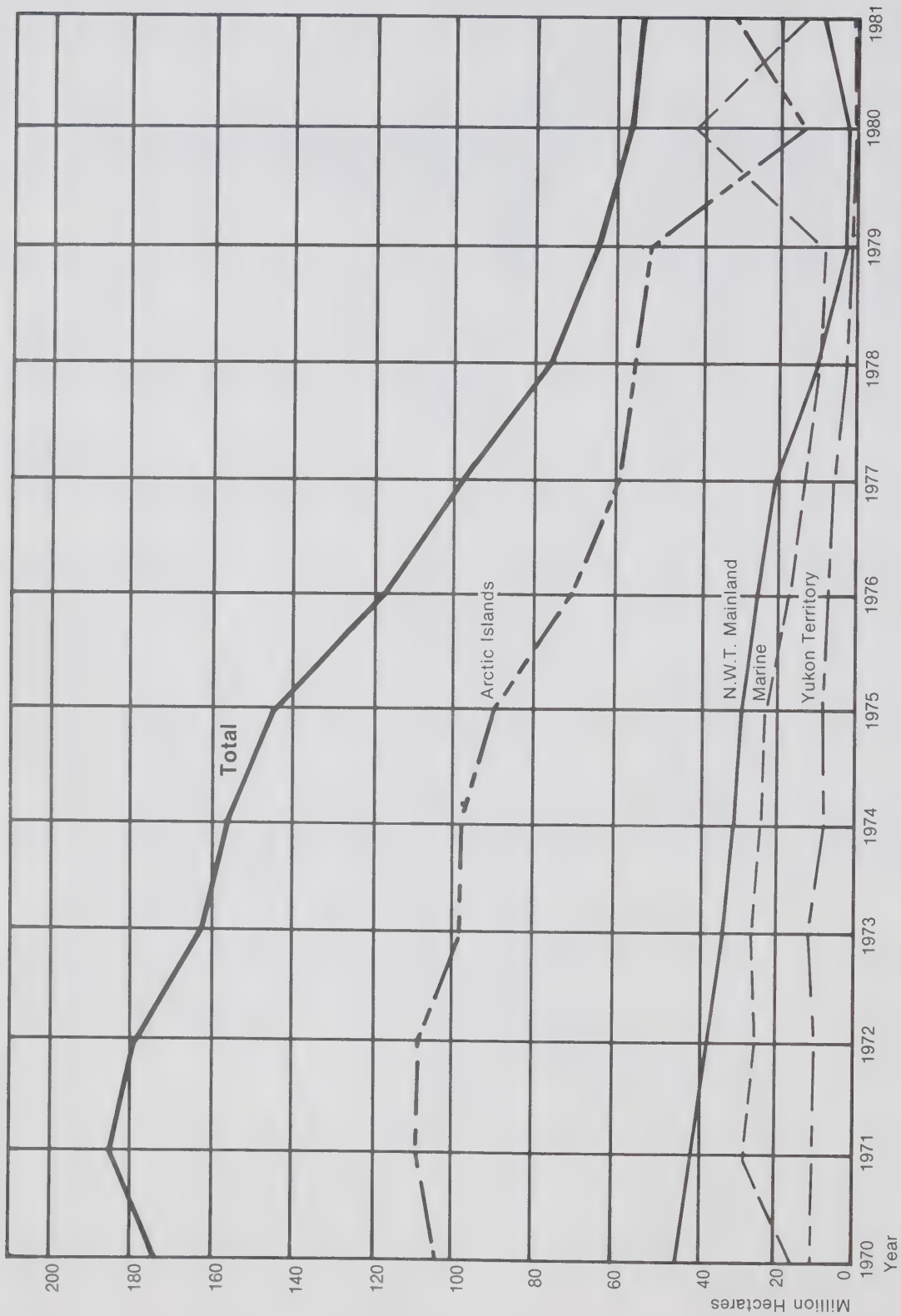
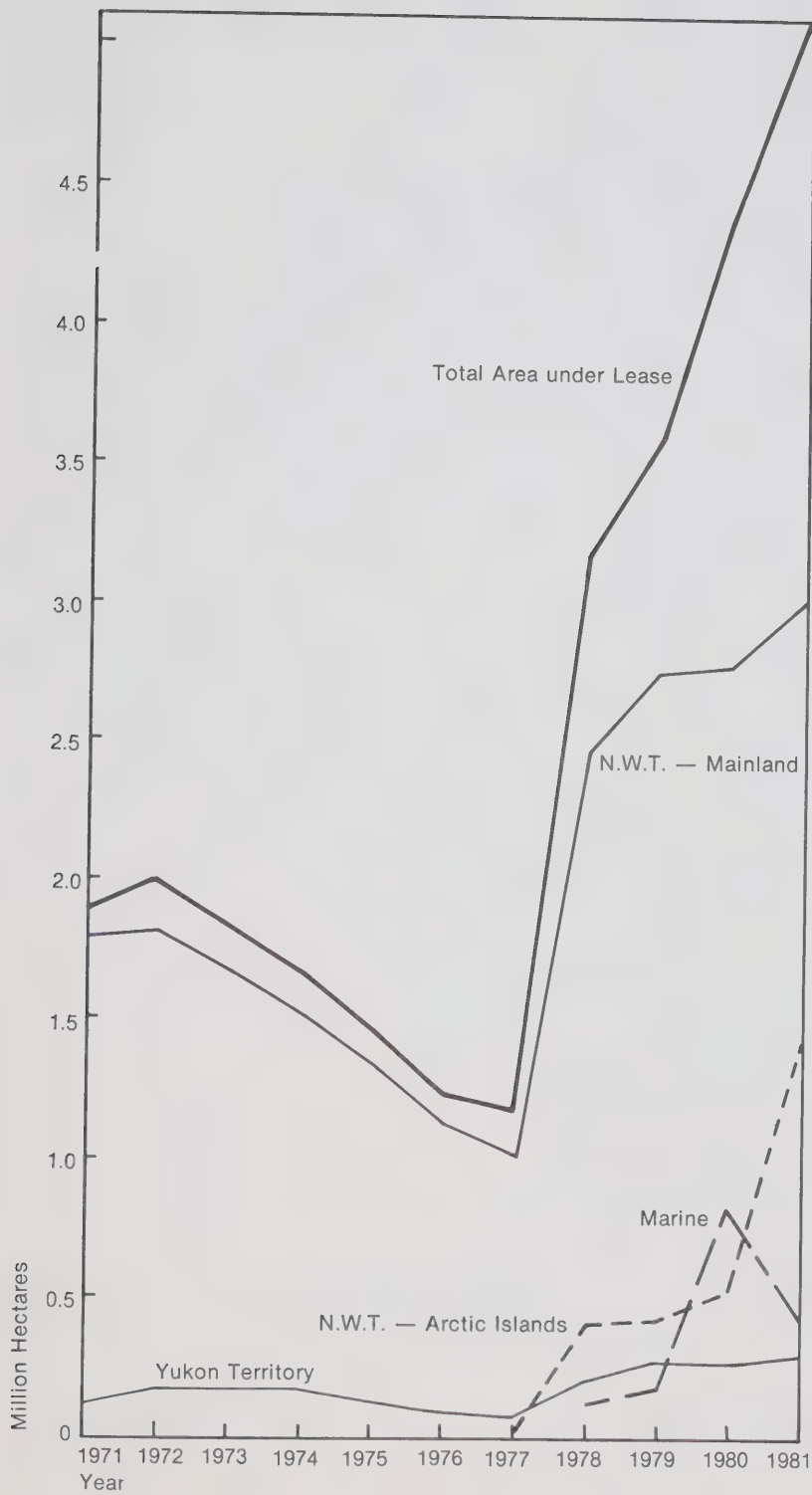




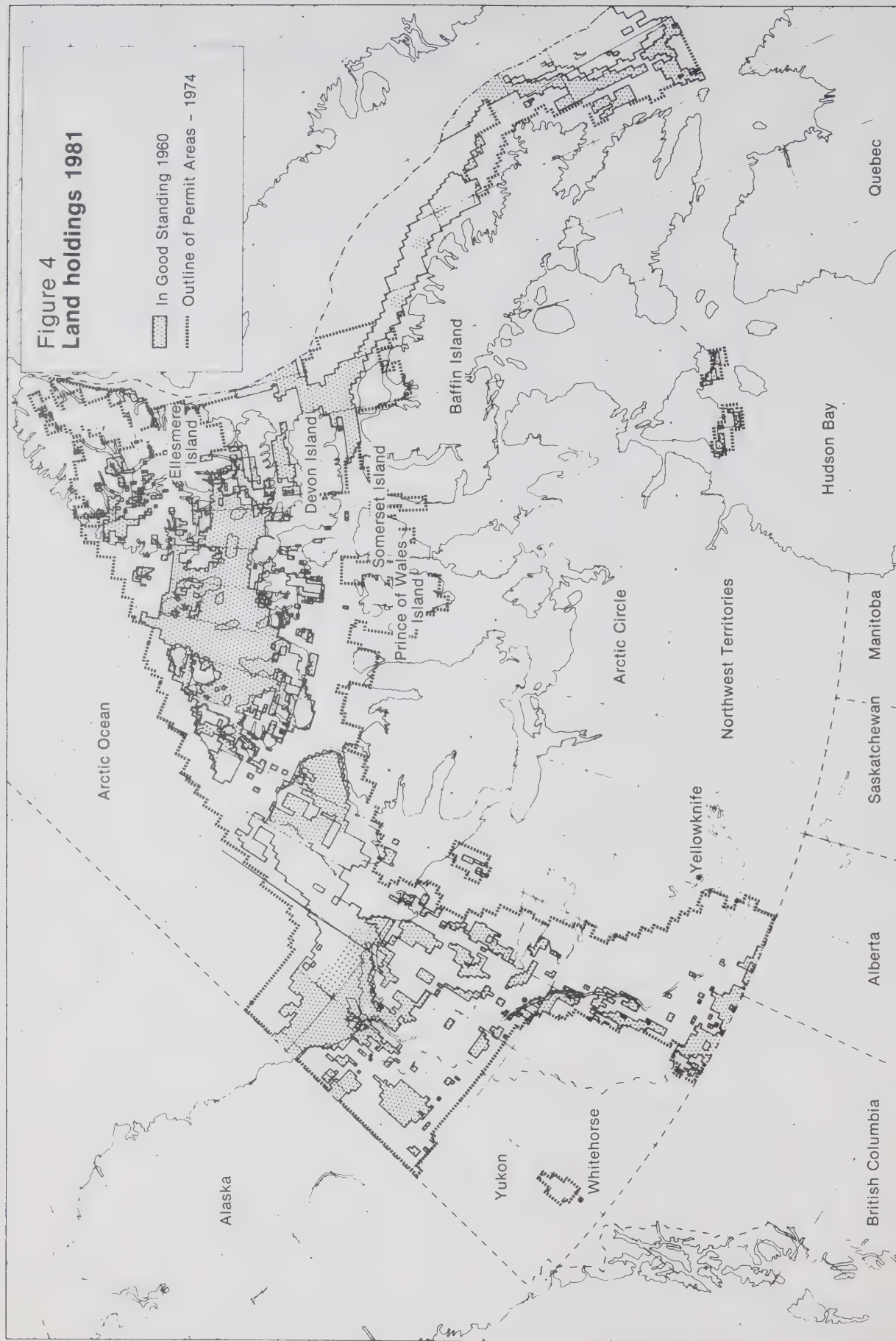
Figure 3  
Area Under Lease by Year





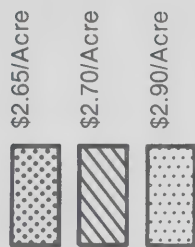
**Figure 4**  
**Land holdings 1981**

 In Good Standing 1960  
 Outline of Permit Areas - 1974

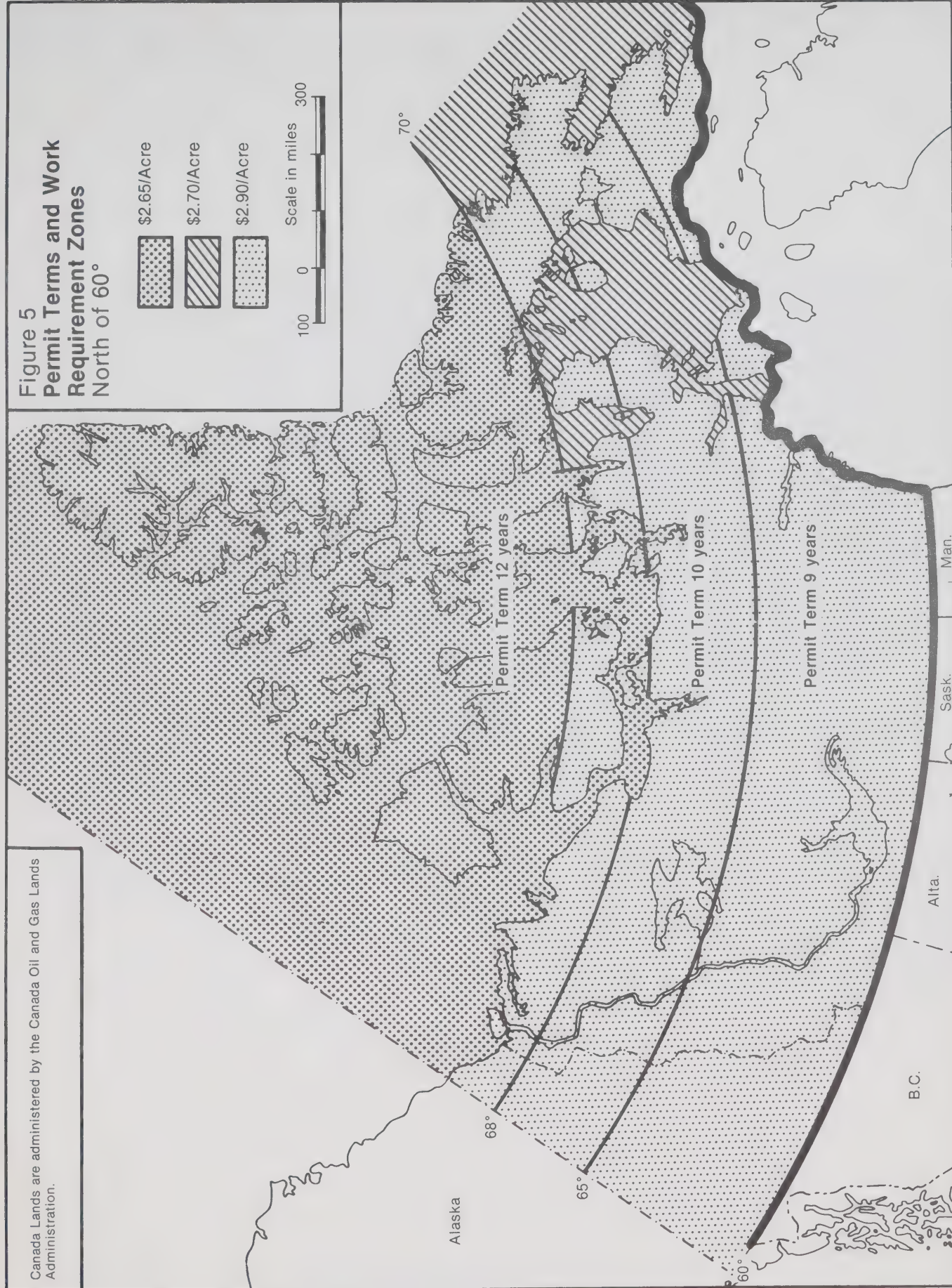


Canada Lands are administered by the Canada Oil and Gas Lands Administration.

**Figure 5**  
**Permit Terms and Work**  
**Requirement Zones**  
North of 60°



Scale in miles 100 0 300





# Acts and Regulations

## Canada Oil and Gas Act

Bill C-48, the Canada Oil and Gas Act, tabled in Parliament near the end of 1980, was examined by the House of Commons Standing Committee for National Resources and Public Works during the early part of the year. The Committee proposed several amendments to the Bill in response to representations made by the oil and gas industry, native groups, northern authorities and other parties interested in or likely to be affected by provisions of the Bill. Just prior to year-end the Bill received third reading in the House of Commons and in the Senate and was proclaimed on March 5, 1982. This Bill is one of the more important elements of the National Energy Program announced in October, 1980. Legislation will be tabled early in 1982 in order to implement the taxation, ownership, incentives and other provisions of the Program for exploration and development of oil and gas in Canada's frontier regions.

The Canada Oil and Gas Act contains a much revised, comprehensive management regime for exploration, development and production of oil and gas from Canada's frontier areas to be administered by the new agency, the Canada Oil and Gas Lands Administration. The Act will increase Canadian ownership of resources through the reservation of a 25% interest to the Crown in all exploration rights. This interest may be assigned to Petro-Canada or other Crown Corporations, or may be offered to Canadian companies by way of a public tender process. As a condition to granting a production licence, the Act requires a minimum level of 50% Canadian ownership of the company producing the resources.

## Canada Oil and Gas Land Regulations

The Act provides that the existing Regulations will continue until revoked or replaced by new specific regulations to be promulgated under the Act. Certain provisions of the existing regulations, particularly as to the forms of grants to be issued, will be overtaken by specific provisions immediately upon proclamation of the Act. The preferential rights for Petro-Canada in the existing regulations will be revoked. However, many of the existing regulatory provisions, including such matters as land division, methods and timing of applications, giving of notices, submission of reports and other information, etc., are likely to remain unchanged during the short term. New specific regulations will be required for such matters as eligible costs and investments for royalties, registration and filing of documents and other information, fees and service charges, operating agreements and arbitration of specific issues.

The terms for permits already issued under the existing *Canada Oil and Gas Land Regulations* are summarized in Figures 5 and 6. Figure 5 shows the permit term in years, including the renewals rented subsequent to the initial term and the total per acre\* minimum work requirements for each period of the permit life and entry into special renewal terms are illustrated in Figure 8. Figure 7 shows diagrammatically the flow of Canada oil and gas rights, through the various disposal channels under the present regulations.

---

\*Since relevant acts and regulations have not yet been changed the conversion to hectares was not made.

**Figure 6**  
**Permit Terms and Deposit Requirements Per Acre**  
**Yukon Territory and Northwest Territories**

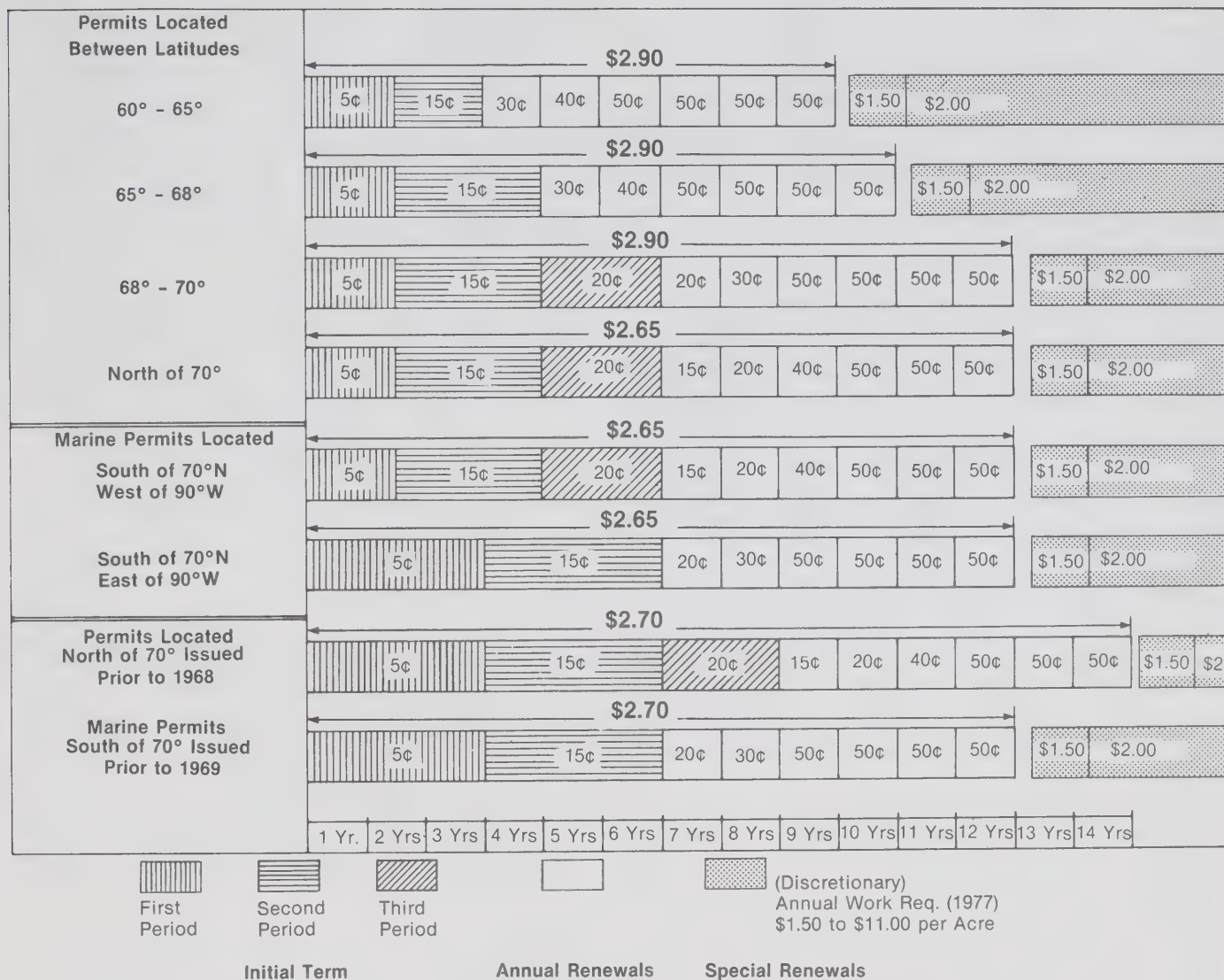
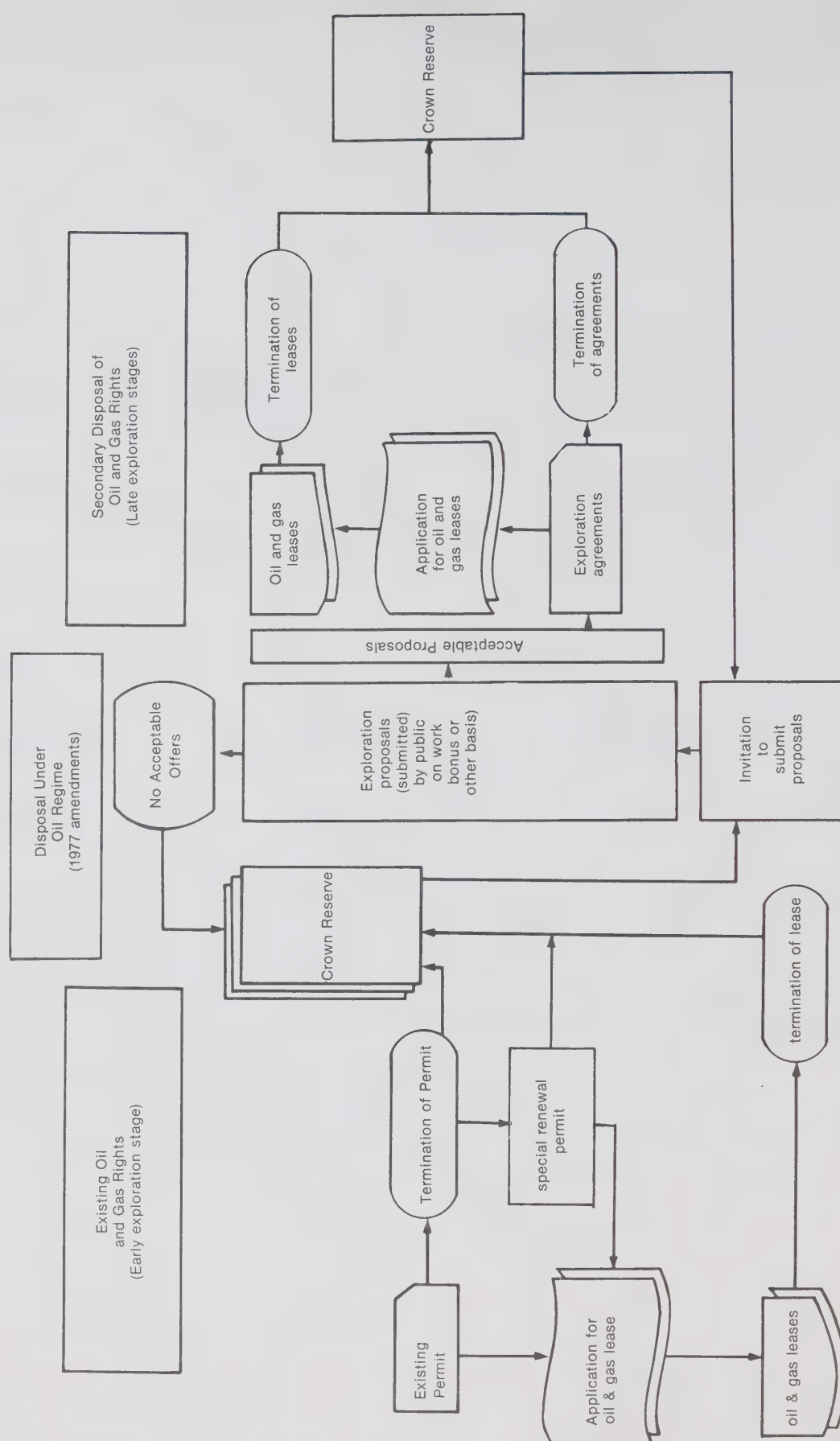




Figure 7  
Disposal of Oil and Gas Rights



### **Canada Oil and Gas Geophysical Regulations**

A joint project was initiated by the departments of Indian Affairs and Northern Development and Energy, Mines and Resources to draft the *Canada Oil and Gas Geophysical Regulations* for promulgation under the *Canada Oil and Gas Production and Conservation Act*. Sections of the regulations will pertain to onshore and offshore geophysical operations on Canada Lands.

The primary intent of these regulations will be to ensure:

- the safety of personnel working on geophysical crews;
- the protection of the living resources of the onshore and marine areas to be surveyed;
- the quality and type of geophysical data submitted to the relevant resource organizations.

In 1980, the Legal Division of Energy, Mines and Resources prepared the final draft for submission to the Department of Justice.

### **Canada Oil and Gas Pipeline Regulations**

These regulations have been drafted over the past several years by staff of the departments of Indian Affairs and Northern Development and Energy, Mines and Resources, under the *Canada Oil and Gas Production and Conservation Act*. Subsequently, joint meetings with an industry task force were held in 1977 to discuss these regulations. The *Canada Oil and Gas Pipeline Regulations* have been submitted to the Legal Division of Energy, Mines and Resources for editing in preparation for promulgation.

### **Canada Oil and Gas Production Regulations**

The Canada Oil and Gas Production Regulations were redrafted by the staff of the two departments in 1979 and were submitted again to the industry task force in 1980 for review and comment.



Dome/Canmar Explorer drillship in the Beaufort Sea.



The Panarctic AIEG PRC PPC Cisco B-66 gas and oil discovery drilled from an ice platform off Lougheed Island in the Sverdrup Basin.

Revenues from northern operations for the calendar year 1981 approximated \$12.3 million (Table 5 and Figure 8), about \$1.2 million higher than in 1980.

Total revenues from all sources for the fiscal year 1981-1982 approximated \$11.1 million (Table 6 and Figure 9) down about \$0.9 million from the previous fiscal year.

Figure 10 shows the annual value of work bonus for oil and gas work bonus blocks, permits and exploration agreements. The cumulative value of work bonus to the end of 1981 was about \$59 million, an increase of \$100 000 from 1978, the result of the issuance of a single exploration agreement to PetroCanada in 1979.

**Table 5**

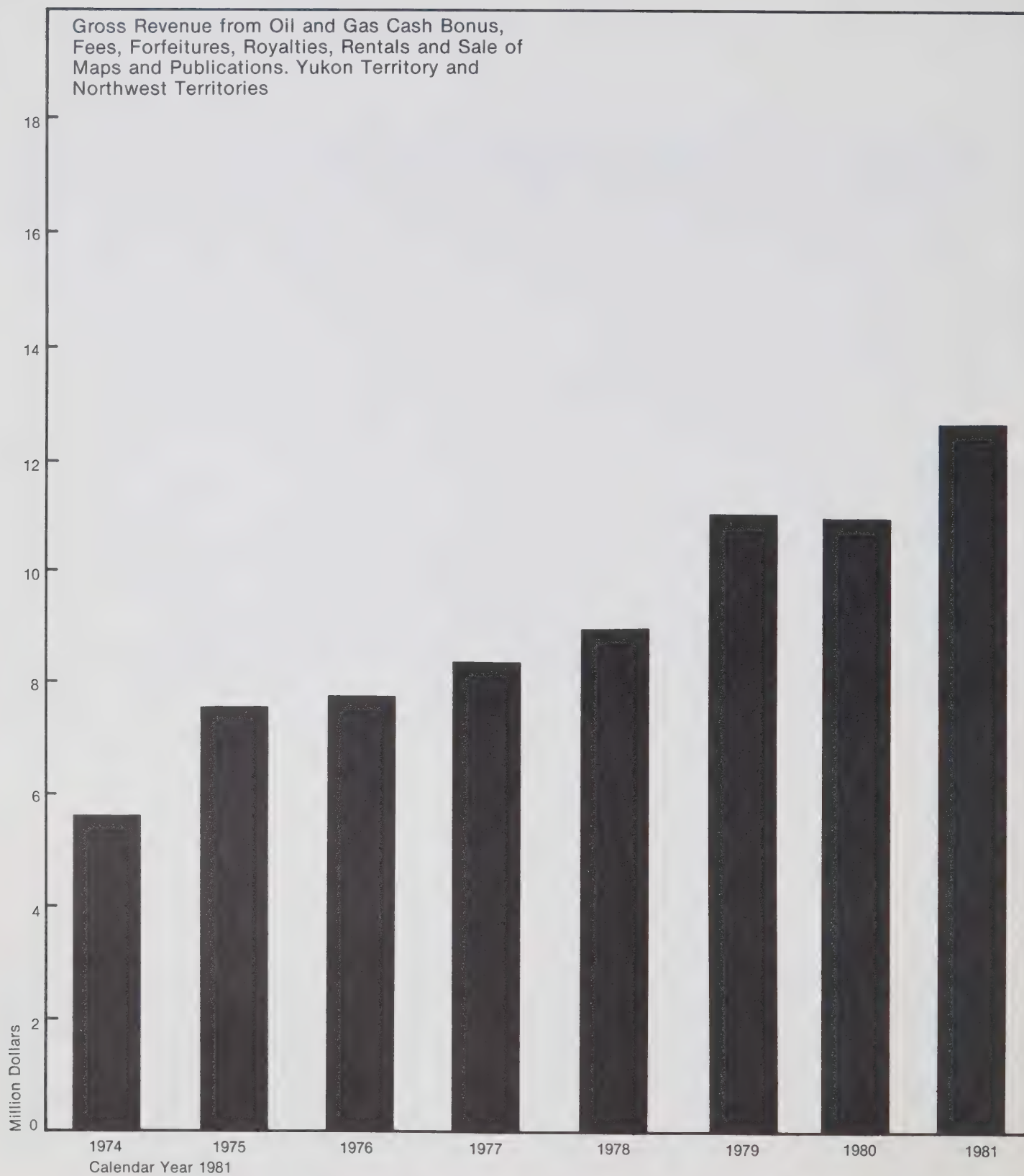
Gross Revenue, Oil and Gas (Calendar Year) 1975 to 1981

Year	Licence Fee	Permit or Exploration Agreement Fee	Transfer Fee	Lease Fee	Rentals	Royalties	Forfeitures	Cash Bonus	Misc.	Total
<b>Northwest Territories</b>										
1975	2 750.00	4 000.00	10 005.00	3 970.00	3 684 559.54	3 425 965.83	172 517.93	—	1 353.53	7 305 121.83
1976	2 425.00	—	14 635.00	4 670.00	2 675 065.79	4 688 996.80	219 104.46	—	5 015.75	7 609 912.80
1977	2 600.00	—	12 635.00	6 320.00	3 266 775.28	4 778 130.10	105 853.49	—	3 506.10	8 175 819.97
1978	2 100.00	—	25 550.00	2 600.00	3 999 061.10	4 337 465.61	270 561.83	—	4 798.55	8 642 137.09
1979	475.00	1 500.00 <sup>1</sup>	18 105.00	1 718.50	5 564 311.51	5 136 151.06	40 300.60	—	31.00	10 762 592.67
1980	475.00	250.00 <sup>1</sup>	42 830.00	3 510.00	5 788 993.49	4 886 629.26	—	—	—	10 722 687.75
1981	350.00	2 250.00 <sup>1</sup>	15 855.00	3 080.00	7 469 763.21	4 470 284.92	—	—	13.96	11 961 597.09
Total	11 175.00	8 000.00	139 615.00	25 868.50	32 448 529.92	31 723 623.58	808 338.31	—	14 718.89	65 179 869.20
<b>Yukon Territory</b>										
1975	—	—	3 610.00	90.00	204 281.25	177 504.68	—	—	—	385 485.93
1976	—	—	45.00	50.00	104 353.00	144 461.20	—	—	—	248 909.20
1977	—	—	1 075.00	110.00	155 065.25	64 318.13	—	—	—	220 568.38
1978	—	—	290.00	320.00	337 081.90	6 710.07	1 845.62	—	—	346 247.59
1979	—	—	80.00	200.00	320 195.25	23 089.77	—	—	—	343 565.02
1980	—	—	1 100.00	20.00	396 871.03	58 526.48	—	—	—	456 517.51
1981	—	—	1 850.00	30.00	347 594.25	2 135.61	—	—	—	351 609.86
Total	—	—	8 050.00	820.00	1 865 441.93	476 745.94	1 845.62	—	—	2 352 903.49
<b>Total Revenues</b>										
1975	7 690 607.76									
1976	7 858 822.00									
1977	8 396 388.35									
1978	8 988 384.68									
1979	11 106 157.69									
1980	11 179 205.26									
1981	12 313 206.95									
Total	67 532 772.69									

<sup>1</sup>Exploration Agreement Fee



Figure 8  
Calendar Year Revenue



**Table 6**  
Gross Revenue, Oil and Gas (Fiscal Year) 1975-1976 to 1981-1982

Year	Licence Fee	Permit or Exploration Agreement Fee	Transfer Fee	Lease Fee	Rentals	Royalties	Forfeitures	Cash Bonus	Misc.	Total
<b>Northwest Territories</b>										
1975-76	1 320.00	—	8 955.00	4 040.00	3 718 493.34	4 352 171.61	165 716.01	—	1 438.75	8 252 134.71
1976-77	3 450.00	—	14 870.00	3 960.00	4 343 465.73	4 672 663.83	142 315.07	—	5 138.65	9 185 863.28
1977-78	825.00	—	15 670.00	6 490.00	3 488 769.99	4 624 080.66	105 853.49	—	2 811.20	8 244 500.34
1978-79	1 125.00	—	25 620.00	2 730.00	5 196 829.46	4 231 446.53	285 579.70	—	3 947.15	9 747 277.84
1979-80	400.00	1 500.00 <sup>1</sup>	16 130.00	1 228.50	4 998 883.82	4 491 795.94	40 300.60	—	22.00	9 550 260.86
1980-81	425.00	250.00 <sup>1</sup>	44 295.00	6 220.00	6 413 973.26	5 187 176.06	—	—	78.96	11 652 418.28
1981-82	25.00	2 250.00 <sup>1</sup>	15 100.00	250.00	6 843 526.24	3 863 929.49	80 106.00	—	—	10 805 186.73
Total	7 570.00	4 000.00	140 640.00	24 918.50	35 003 941.84	31 423 264.12	819 870.87	—	13 436.71	67 437 642.04
<b>Yukon Territory</b>										
1975-76	—	—	3 635.00	90.00	184 243.25	195 397.97	—	—	—	383 366.22
1976-77	—	—	1 095.00	80.00	130 779.75	122 435.71	—	—	—	254 390.46
1977-78	—	—	—	140.00	230 641.15	29 216.00	1 845.62	—	—	261 842.77
1978-79	—	—	230.00	420.00	299 291.90	4 514.52	—	—	—	304 456.42
1979-80	—	—	115.00	40.00	392 012.28	94 428.24	—	—	—	486 595.52
1980-81	—	—	2 865.00	50.00	349 327.00	18 325.85	—	—	—	370 567.85
1981-82	—	—	50.00	250.00	295 932.25	—	—	—	—	296 232.25
Total	0	0	7 990.00	1 070.00	1 882 227.58	464 318.29	1 845.62	0	0	2 357 451.49
<b>Total Revenues</b>										
1975-76	8 635 500.93									
1976-77	9 440 253.74									
1977-78	8 506 343.11									
1978-79	10 051 734.26									
1979-80	10 036 856.38									
1980-81	12 022 986.13									
1981-82	11 101 418.98									
Total	69 795 093.53									

<sup>1</sup>Exploration Agreement Fee

Figure 9  
Fiscal Year Revenue

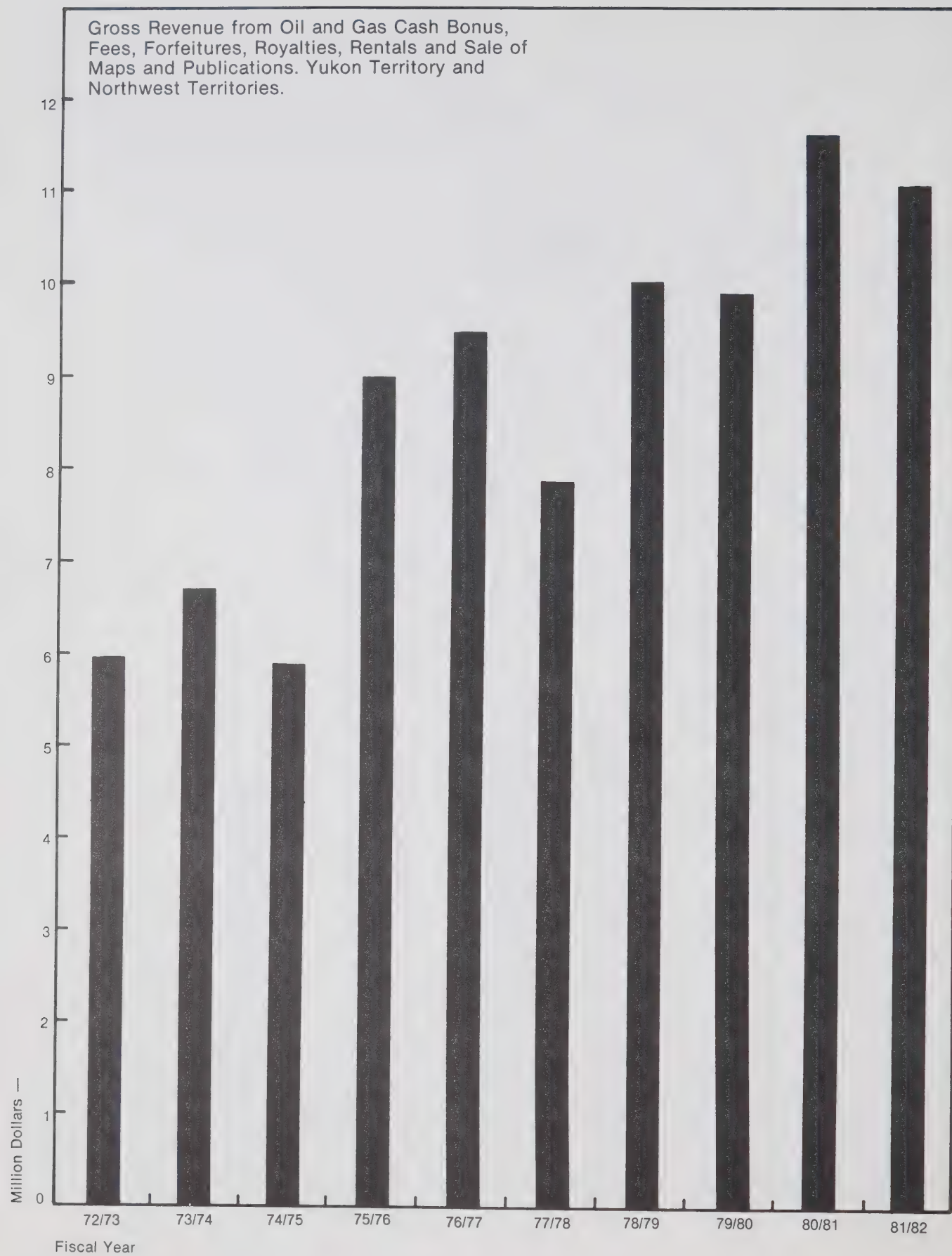
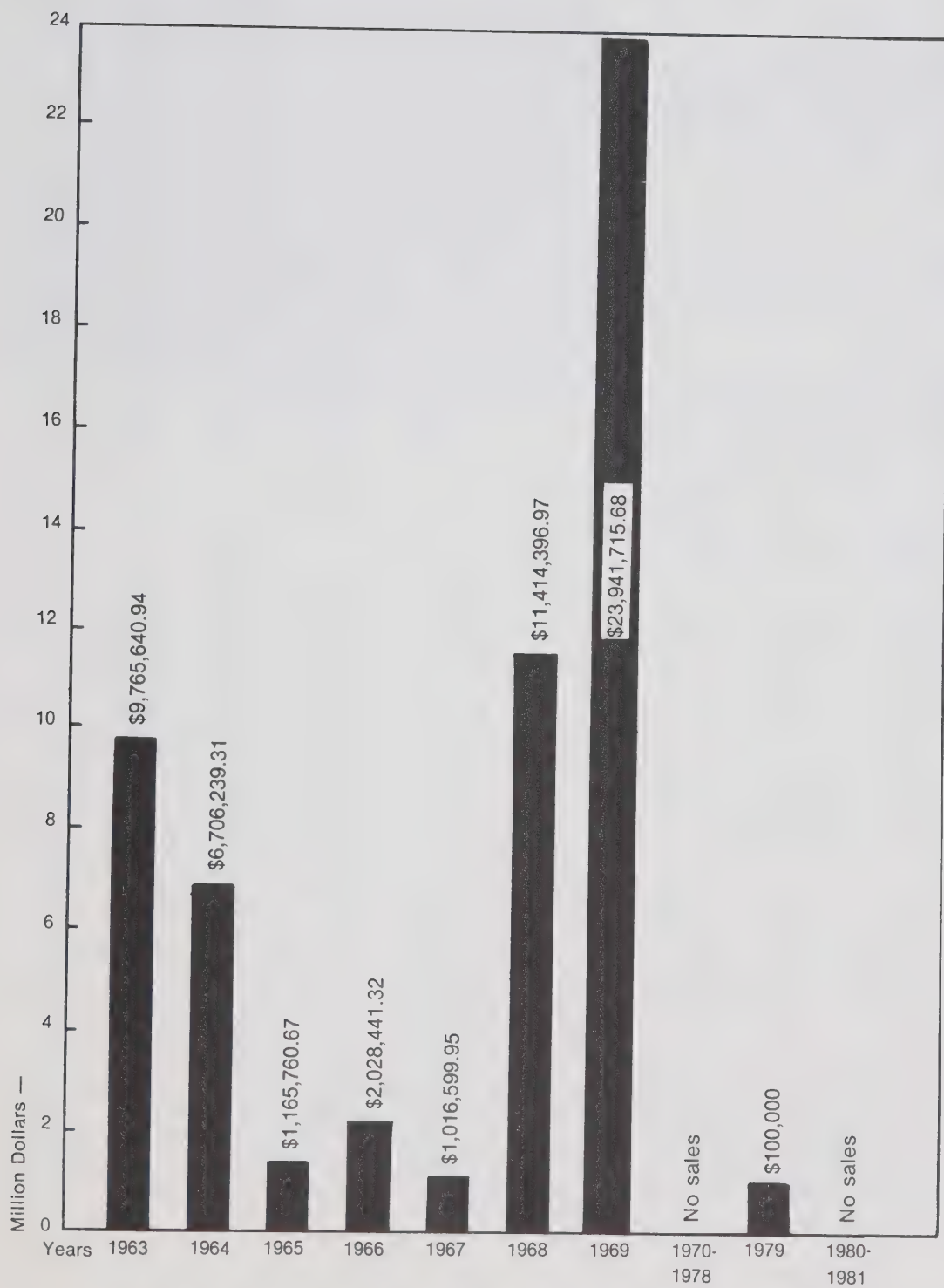


Figure 10  
**Value of Work Bonus Tenders**  
 Yukon Territory and Northwest Territories





# Exploration, Drilling Operations and Discoveries

## Exploration

### *Geological and Geophysical Surveys*

As in previous years geological field work was at minimum levels. Yukon Oil and Gas conducted a small program in the central Yukon Territory, and Panarctic carried out several small programs in the Arctic Islands.

### *Land Seismic Surveys*

Land seismic surveys remained at approximately the same levels in 1981 as in 1980. Crew-months decreased to 16.5 from 17.1 and line-kilometres to 2 875 in 1981 from 4 345 in 1980.

On the mainland Northwest Territories, Esso and Mobil conducted programs totalling 1 400 line-km. In the Arctic Islands, Chevron and Panarctic carried out programs totalling 1 475 km.

### *Marine Seismic Surveys*

Marine seismic surveys increased in 1981 as compared with 1980, with about 13 100 km being run.

In the Beaufort Sea, Dome Petroleum and Canadian Superior and Geophysical Services Inc. carried out programs totalling 12 000 km.

Aquitaine completed surveys totalling 1 100 km. in the Baffin Bay – Davis Strait area.

Table 7 shows the exploration survey statistics for all areas north of 60° and the comparison of the 1981 activities with those of previous years.

## Drilling

Drilling activity decreased in 1981. Thirteen wells, twelve exploratory and one development, were drilled in the Northwest Territories with a total depth of 38 990 m. None were drilled in the Yukon Territory.



Esso Alerk P-23 artificial island in the Beaufort Sea.

## Offshore

### *Western Arctic*

Dome/Canmar continued its drilling activity for the sixth consecutive year, in the offshore Beaufort Sea. Kopanoar 2144 was re-entered and completed, and testing revealed significant recoveries of oil and gas. Koakoak O-22 was also re-entered and completed and testing indicated significant recoveries of oil and gas. Kilannak A-77 was the only other Dome/Canmar operational well in the Beaufort Sea to reach total depth in 1981, and it was abandoned. Kenalooak J-94 and Orvilruk O-03 were re-entered and Irkaluk B-35 was spudded in 1981 and suspended before reaching final total depth. All three wells will be re-entered in 1982.

Gulf Canada, utilizing one of the Canmar drill-ships, drilled Gulf North Issungnak L-86 to total depth. It was abandoned without testing.

Esso operated two wells, both from sacrificial beach type constructed islands. Issungnak 2 O-61 was a delineation well to the Issungnak O-61 discovery, and was drilled from the same island. The well was completed, and testing revealed significant reserves of oil and gas. Esso Alerk P-23 was drilled to total depth and abandoned without encountering oil or gas.

**Figure 11**  
**Exploration Activity**  
Yukon Territory and Northwest Territories

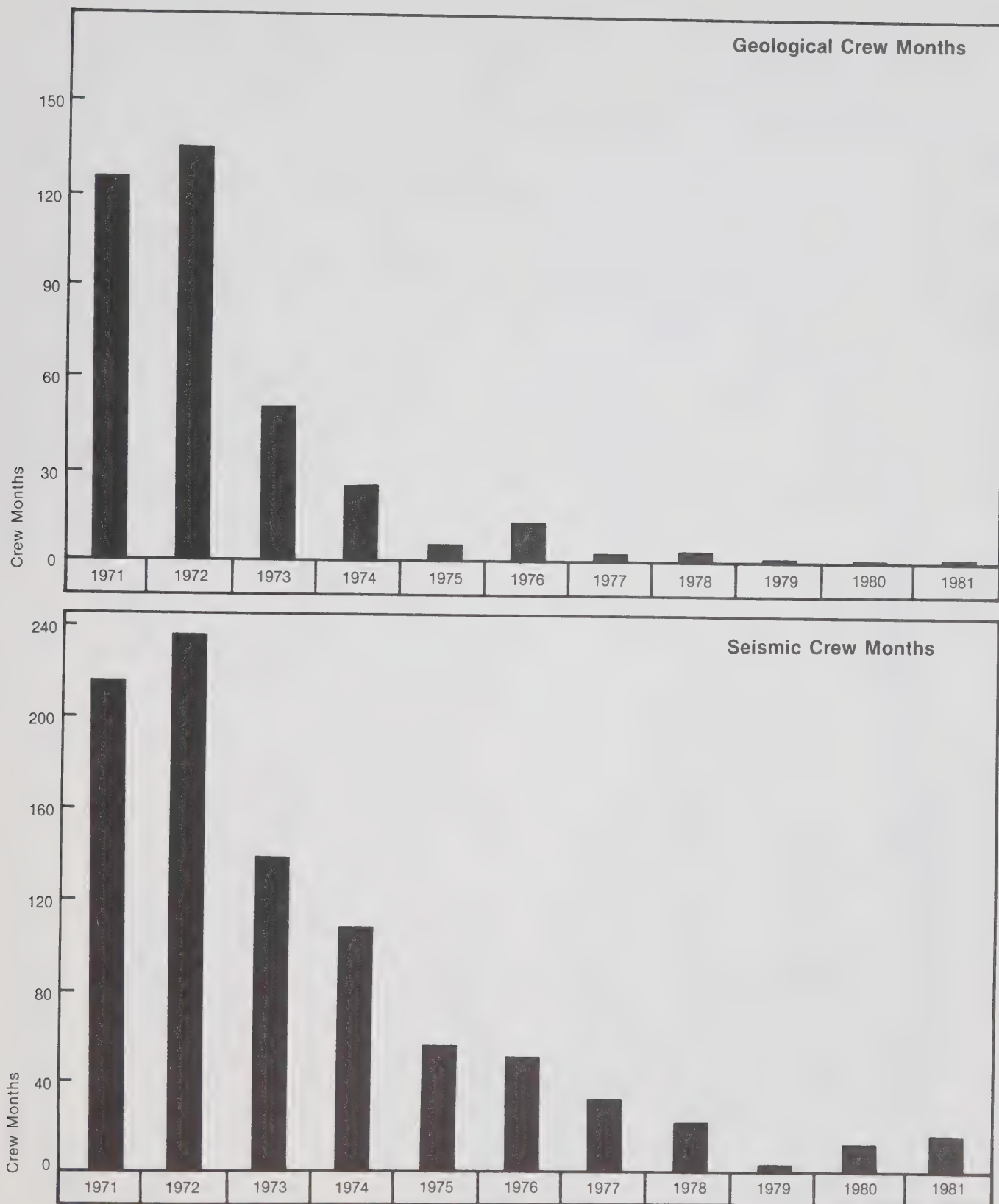
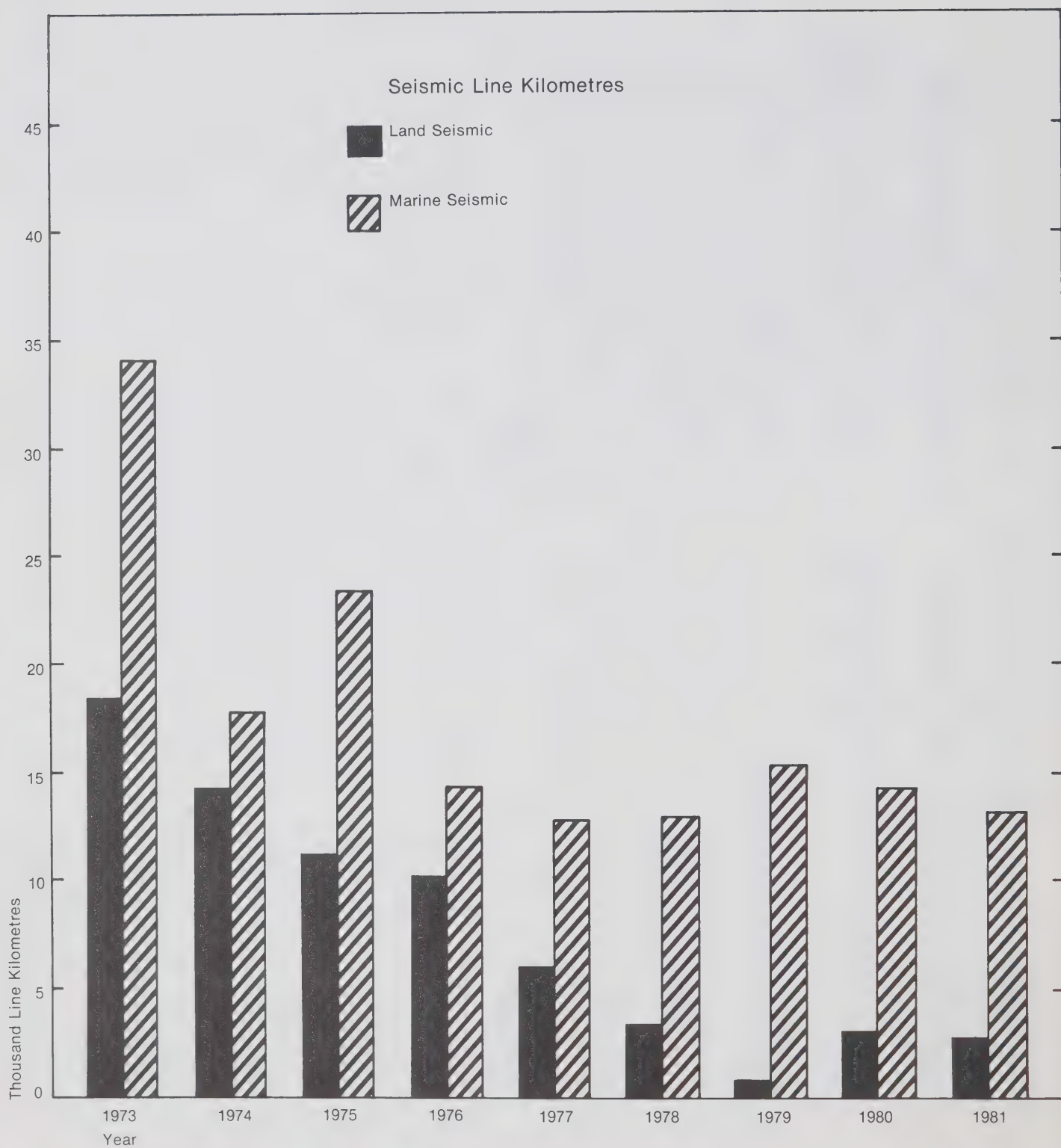


Figure 12  
**Exploration Activity**  
Yukon Territory and Northwest Territories



**Table 7**  
1973-1981 Exploration Survey Statistics

	Yukon Territory	N.W.T. Mainland	Mackenzie Delta	Beaufort Sea	Arctic Islands and Surrounding Water	Baffin Bay- Davis Strait	Total
<b>Geological</b>							
<b>Crew Months</b>							
1973	3.0	9.0	0	0	37.0	1.0	50.0
1974	3.5	1.5	4.5	0	15.5	0	25.0
1975	0	0	0	0	3.5	1.0	4.5
1976	4.0	1.5	1	0	5.5	1.0	13.1
1977	0	0	1.5	0	1.0	0	2.5
1978	0	0	3.0	0	1.0	0	4.0
1979	0	0	0	0	1.0	0	1.0
1980	0	1.8	0	0	0.3	0	2.1
1981	0.3	0	0	0	1.0	0	1.3
<b>Land Seismic</b>							
<b>Crew Months</b>							
1973	10.0	25.0	42.0	4.0	58.0	0	139.0
1974	3.0	27.0	41.0	2.0	37.0	0	110.0
1975	0	14.5	10.5	0.1	32.0	0	57.1
1976	0	3.0	18.5	1.0	29.5	0	52.0
1977	0	0.5	10.0	0	21.5	0	32.0
1978	0	2.0	8.0	0	7.5	0	17.5
1979	0	0	0	0	5.0	0	5.0
1980	0	6.0	3.5	0	7.6	0	17.1
1981	0	8.7	0	0	7.8	0	16.5
<b>Seismic Line-</b>							
<b>Kilometres</b>							
<b>Land</b>							
1973	984	1 855	5 593	757	8 939	0	18 127
1974	195	3 111	5 200	121	5 520	0	14 147
1975	0	2 531	1 093	14	7 449	0	11 089
1976	0	5 435	3 353	124	6 499	0	10 519
1977	0	77	811.9	0	4 843.3	0	5 732.5
1978	0	143	671	0	2 446	0	3 260
1979	0	5.4	0	0	780.2	0	785.6
1980	0	968	1 944	0	1 433	0	4 345
1981	0	1 400	0	0	1 475	0	2 875
<b>Marine</b>							
1973	0	29	0	7 412	8 061	17 834	33 337
1974	0	0	0	2 776	6 697	8 167	17 641
1975	0	0	0	4 135	5 380	14 638	24 153
1976	0	0	69	4 515	2 151	7 879	14 614
1977	0	0	0	4 668.7	3 410.2	4 129.6	12 208.5
1978	0	0	0	5 747	0	6 896	12 643
1979	0	123	0	8 056	0	7 110	15 289
1980	0	100	0	8 396	0	155	8 651
1981	0	0	0	12 000	0	1 100	13 100





# Oil and Gas Fields and Discoveries

## Yukon Territory

- 1 Kotaneelee Gas Field
- 2 Chance Gas Field
- 3 Socony Mobil et al Blackie No. 1
- 4 Socony Mobil et al Birch Y.T. B-34

## Northwest Territories

- 5 Pointed Mountain Gas Field
- 6 Rabbit Lake Gas Field
- 7 C.P.O.G. et al LaBiche F-08
- 8 H.B. Cameron Hill A-05
- 9 S. Island River Gas Field
- 10 Home Signal Celibeta H-78
- 11 Shell H.B. Grumbler G-63
- 12 Sun Netla C-07
- 13 Texaco Bovie Lake J-72
- 14 Union Pan Am. Trainer Lake C-39
- 15 Pacific Amoco Tathlina N-18
- 16 Normal Wells Oil Field
- 17 Taglu Gas Field
- 18 Parsons Gas Field
- 19 Gulf Imperial Shell Titalik K-26
- 20 Gulf Imperial Shell Reindeer F-36
- 21 Gulf Mobil Ya Ya P-53 and A-28 Gas Pools
- 22 Shell Niglintgak H-30 and M-19
- 23 Imperial I.O.E. Mallik L-38

- 24 Imperial Ivik J-26
- 25 I.O.E. Mayogiak J-17
- 26 I.O.E. Atkinson H-25
- 27 Shell Kugpiik O-13
- 28 Imp. Adgo F-28
- 29 Ashland Tedji Lake F-24
- 30 Kumak Oil and Gas Field
- 31 Garry Oil and Gas Field
- 32 Imp. Netserk F-40
- 33 Gulf Mobil Kamik D-48
- 34 Dome Hunt Nektoralik K-59
- 35 Dome Gulf et al Ukalerk C-50
- 36 Hunt Dome Kopanoar M-13
- 37 Imp. Isserk E-27
- 38 Paramount et al Cameron J-62
- 39 Paramount et al Liard D-29
- 40 Esso et al Issungnak O-61
- 41 Dome Koakoak O-22
- 42 Dome et al Tarsiut A-25

## Arctic Islands

- 51 Drake Point Gas Field
- 52 Hecla Gas Field
- 53 King Christian Gas Field
- 54 Panarctic Tenneco et al Kristoffer Bay B-06
- 55 Dome Arctic Ventures Wallis K-62
- 56 Thor Gas Field
- 57 Panarctic Whitefish
- 58 Dome Sutherland O-23
- 59 Panarctic Bent Horn N-72, A-02
- 60 Panarctic Jackson Bay G-16A
- 61 Panarctic Roche Point
- 62 Aquitaine Hekja O-71
- 63 Panarctic et al Balaena D-58
- 64 Panarctic et al Char G-07
- 65 Panarctic et al Maclean I-72
- 66 Panarctic et al Cisco B-66
- 67 Panarctic et al Skate G-80





## Eastern Arctic

There was no drilling activity in the Baffin Bay-Davis Strait area in 1981.

## Arctic Islands

Panarctic continued its exploration of the Arctic Islands, drilling from artificially thickened ice platforms at three offshore locations. The testing of these wells resulted in three oil and gas discoveries. Oil flowed to surface at the Skate B-80 well, the first such occurrence from Mesozoic sediments in the Arctic Islands. Oil and gas were also tested in the MacLean I-72 and Cisco I-66 wells.

In addition to the offshore drilling program, Panarctic drilled a development well at Bent Horn G-02, and Panarctic and Dome drilled an exploratory well at N. Hoodoo N-52. Both of these wells were dry and abandoned.

## Southern Mainland

Sulpetro drilled a well at Trout Lake and Paramount drilled a delineation well at its Cameron Hills gas prospect. Both wells were dry and abandoned.

## Mackenzie Delta

No onshore wells were drilled in the Mackenzie Delta in 1981.

## Yukon

No wells were drilled in the Yukon Territory in 1981.

## Discoveries

Six discoveries or extensions to existing fields were made in 1981. In the Arctic Islands, Panarctic Oils reported an oil discovery at their Cisco B-66 well, oil and gas at the Skate well, and gas at MacLean well.

The Delta-Beaufort Sea area recorded two significant discoveries and extensions to previous discoveries. Esso Resources' Issungnak 2 O-61 delineation well recovered oil and gas from the pool discovered in 1980. Dome Petroleum discovered oil and gas at its Koakoak O-22 well, and recovered oil and gas at the Kopanoar 2 I-44 delineation well.

**Table 8**

Wells Abandoned or Completed in 1981.

Thirteen wells were drilled to total depth in 1981. The total depth drilled was 38 990 m. (D & A indicates dry and abandoned, WDW indicates water disposal well.)

Name of Well	Spudded	Completed	Status	Total Depth (metres)
<b>Northwest Territories — Arctic Islands</b>				
Panarctic et al Cisco B-66 B-66-77-30-106-00	81-02-01	81-05-04	Oil Discovery	2 412
Panarctic et al Maclean I-72 I-72-77-40-103-30	81-01-27	81-04-27	Gas Discovery	2 475
Panarctic et al Skate G-80 G-80-77-50-104-30	81-01-20	81-04-04	Oil & Gas Discovery	1 655
Panarctic et al N. Hoodoo N-52 N-52-78-10-099-30	81-09-28	81-11-11	D & A	1 650
Panarctic W. Bent Horn G-02 G-02-76-30-104-00	81-05-29	81-09-04	D & A	3 220
<b>Northwest Territories — Beaufort Sea</b>				
Dome et al Kilannak A-77 A-77-70-50-129-00	80-09-10	81-09-04	D & A	2 996
Dome Koakoak O-22 O-22-70-30-134-00	79-11-05	81-10-31	Susp. Oil and Gas Discovery	4 365
Dome et al Kopanoar 2 I-44 I-44-70-30-135-00	80-08-02	81-10-29	Susp. Oil and Gas Discovery	4 010
Gulf et al N. Issungnak L-86 L-86-70-10-134-00	81-07-17	81-10-16	D & A	4 771

Name of Well	Spudded	Completed	Status	Total Depth (metres)
Esso et al Alerk P-23 P-23-70-00-132-45	81-09-21	81-12-24	D & A	3 223
Esso et al Issungnak 2 O-61 O-61-70-10-134-00	80-10-02	81-08-13	Oil and Gas Discovery	4 460
<b>Northwest Territories — Mainland</b>				
Paramont et al Cameron J-76 J-76-60-10-117-00	81-02-08	81-03-12	D & A	1 627
Sulpetro et al Trout Lake P-34 P-34-60-30-121-00	81-01-15	81-02-25	D & A	2 126

### 1982 Forecast

General activity will be similar to 1981. The main drilling activity areas will be the Arctic Islands, the Mackenzie Delta-Beaufort Sea and one well in the Davis Strait area.

It is expected that exploration in the Arctic Islands will continue at the same pace as in 1981. At least four wells will be drilled, all from artificial ice-islands. Seismic surveys will continue in the Lougheed Island area, as well as on land on the Sabine Peninsula.

Dome Petroleum will be drilling for the seventh season in the Beaufort Sea, utilizing three drillships and commencing as soon as ice conditions permit. Present plans are to deploy three drillships at Orvilruk O-03, Kenalooak J-94, and Irkaluk B-35 to re-enter these wells drilled in previous years, to drill to total depth and test. Gulf will use one of the Canmar drillships to drill on the Tarsiut structure. New wells are also being considered along with further dredging of prospective artificial island sites. A unique steel caisson-supported island will be constructed in 1982 from a very large cargo carrier (VLCC) hull. Drilling is to commence in the winter of 1982-83.

Esso will drill their W. Atkinson L-17 location in 1982 with a possible second well in the near shore delta area. Esso also plans to utilize a steel caisson island design at the Esso Kudluk H-08 well location for drilling commencing in the fall of 1983.

Gulf Resources will complete the testing of the E. Tarsiut N-44 well, and drill another well from the same caisson-retained island. They also expect their first of a new generation of moored drilling barges to be operative in 1983.

In March 1980 Esso submitted a plan to initiate a secondary recovery scheme for the Norman Wells field. This will involve drilling of injection and production wells on the mainland, on the two natural islands and from six artificial islands that are to be constructed in the Mackenzie River. Drilling activity to initiate water injection will commence in the fall of 1982.

In the southern Territories, several operators will continue to drill shallow and medium depth wells to search for hydrocarbons in Devonian carbonates.



**Figure 13**  
**Wells Completed or Abandoned in 1981**  
 Southern Northwest Territories and Yukon Territory

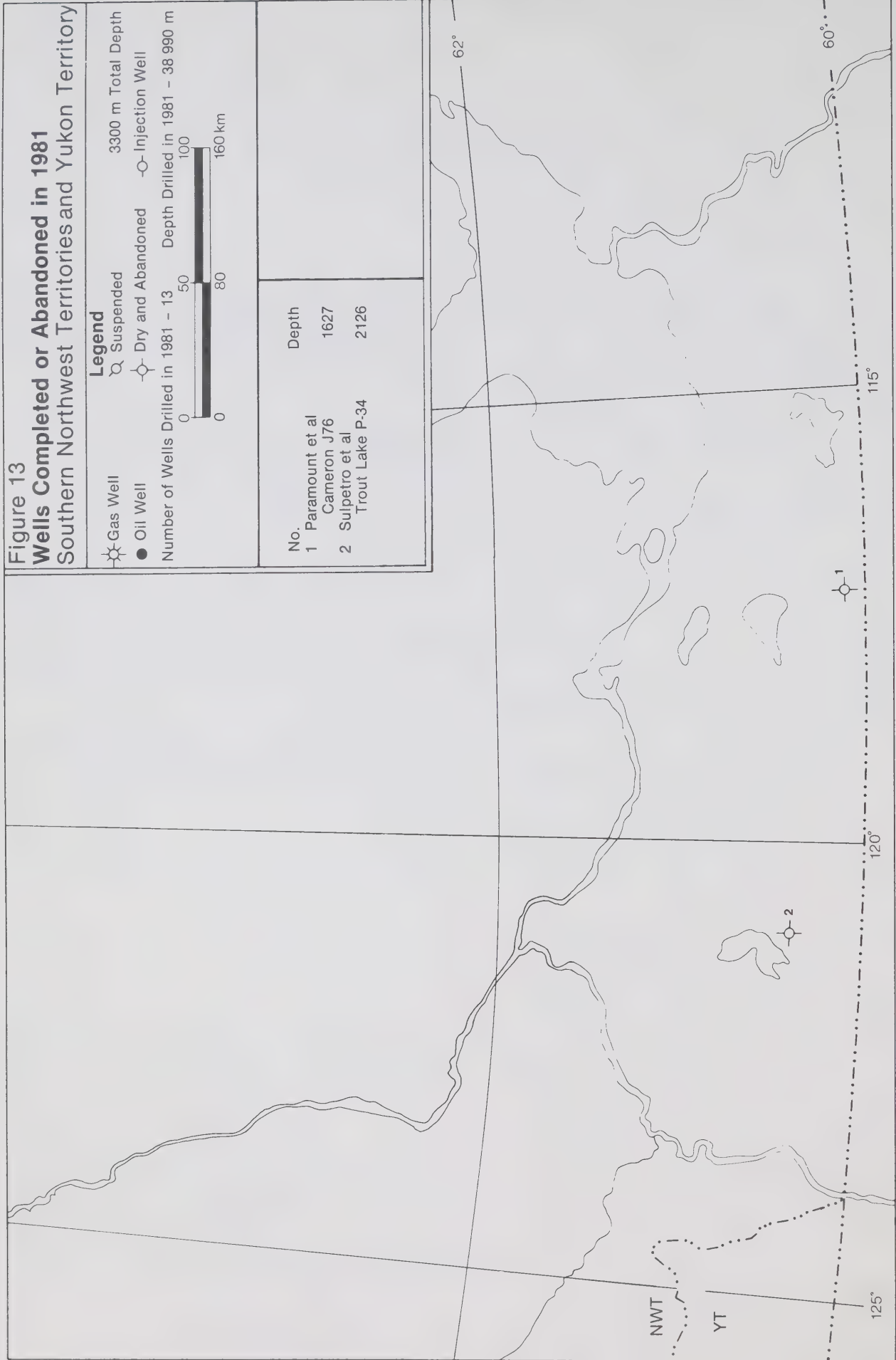


Figure 14

# Wells Completed or Abandoned in 1981 Mackenzie Delta — Beaufort Sea

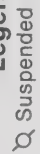
## Legend



Gas Well



Oil Well



Suspended



Dry and Abandoned

3300 m Total Depth

—○— Injection Well

Number of Wells Drilled in 1981 — 13      Depth Drilled in 1981 — 38 990 m



No.	Depth
1 Dome et al Kilannak A-77	2996
2 Dome Kookoak O-22	4365
3 Dome et al	4010
4 Kopanoar 2 I-44 Gulf et al N.	4771
5 Issungnak L-86	3223
6 Esso et al Alerk P-23	4460
Issungnak 2 O-61	

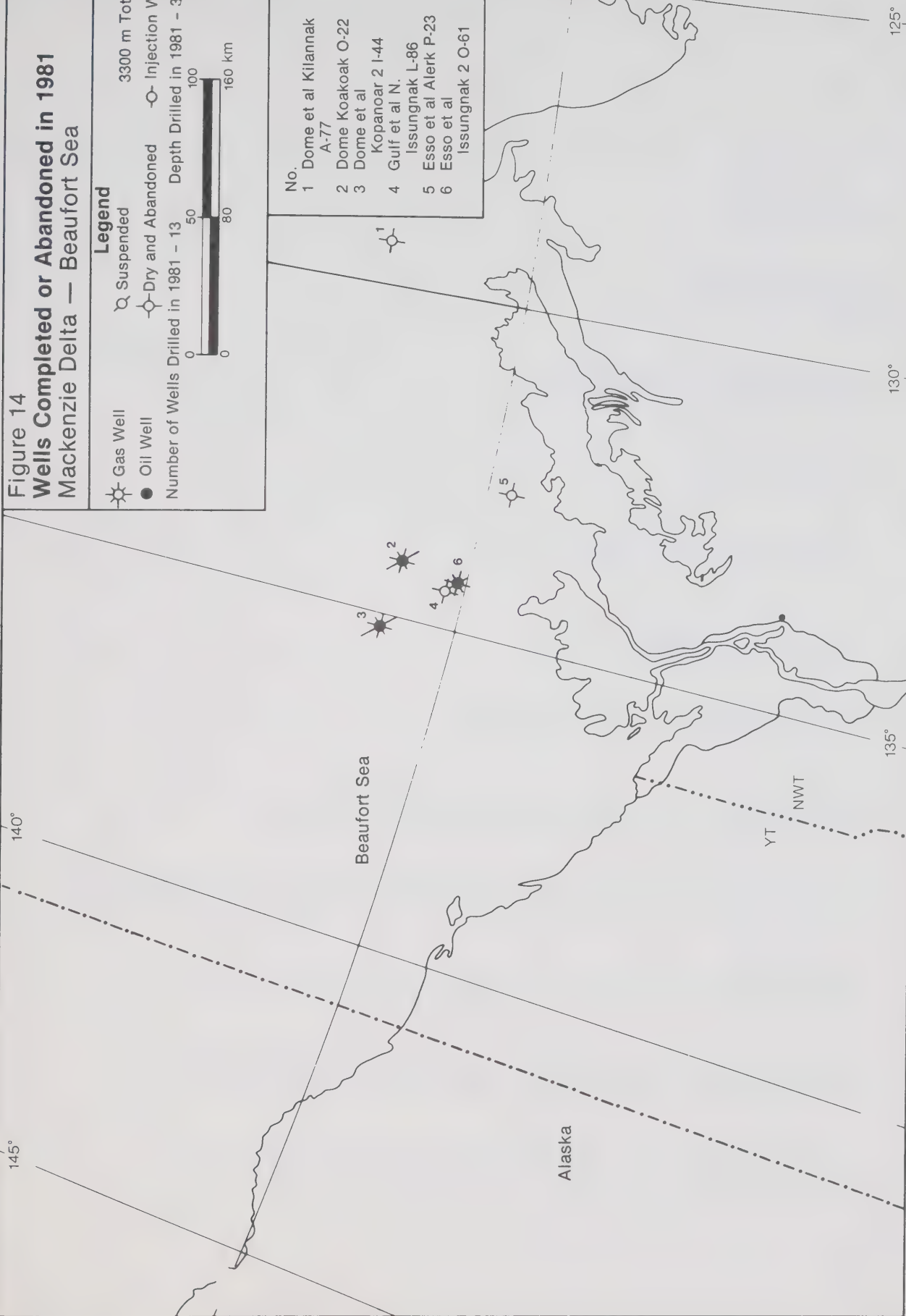


Figure 15

# Wells Completed or Abandoned in 1981 Arctic Islands

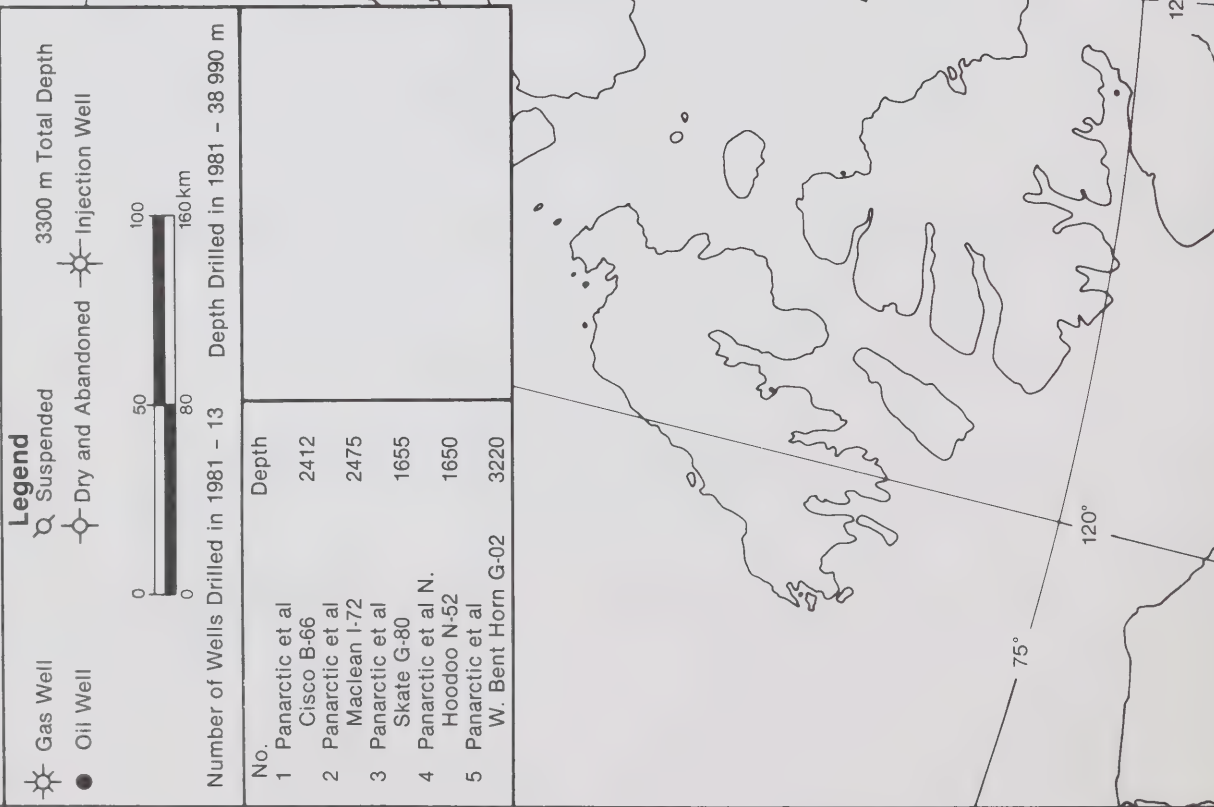


Figure 16  
**Wells Drilled**  
Yukon Territory and Northwest Territories

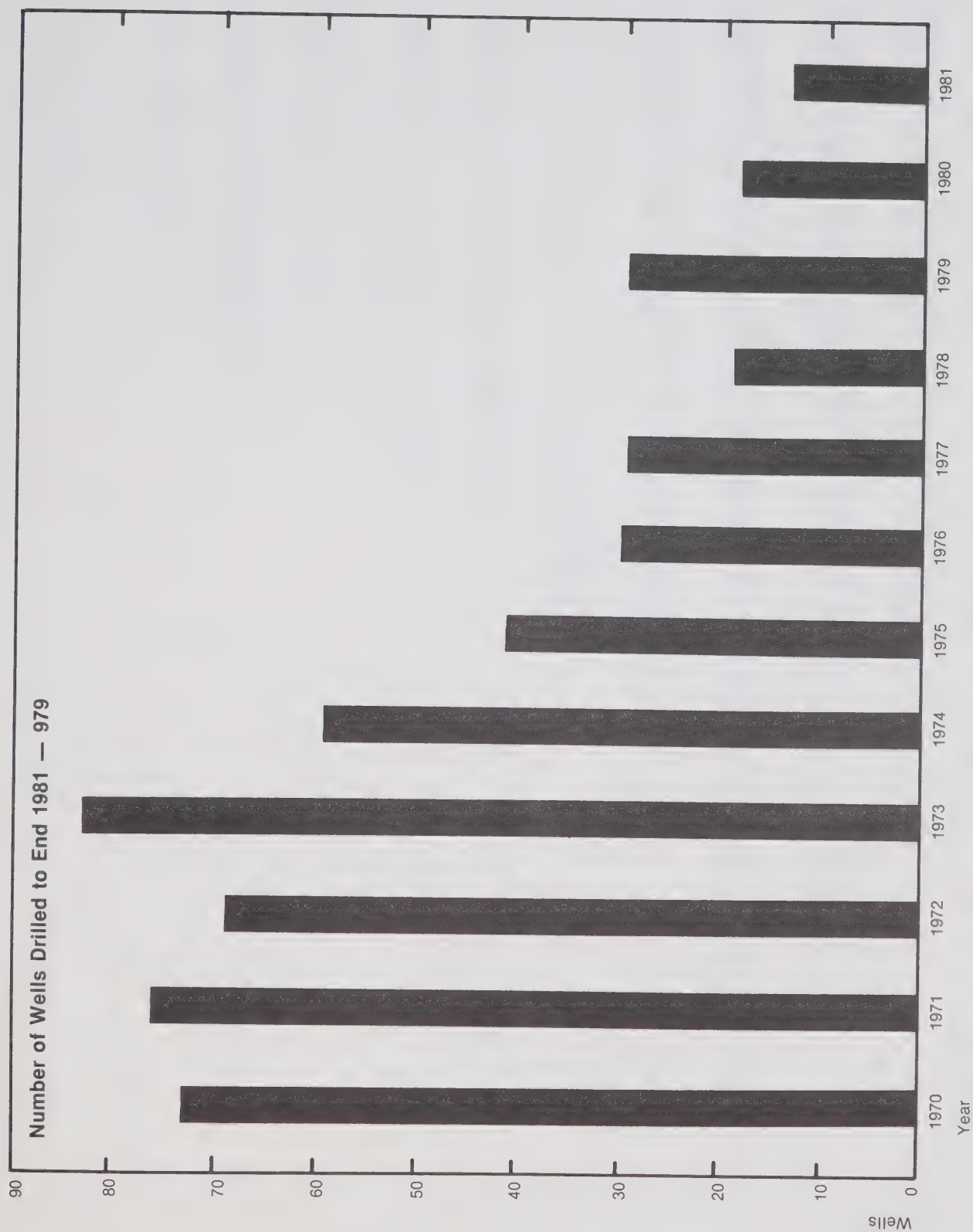




Figure 17  
**Depth Drilled**  
Yukon Territory and Northwest Territories



# Net Cash Expenditures by Industry in 1981

Total expenditures, according to information compiled by the Department of Indian Affairs and Northern Development, Statistics Canada and the Canadian Petroleum Association are shown in Tables 9 and 10 and Figure 18. Gross industry expenditures north of 60° increased over those of 1980 by approximately \$229 million, to reach a total of \$847 million. Exploratory and development drilling expenditures increased to \$698 million (up 57 per cent), while total geological and geophysical expenditures increased to \$57 million, a 37 per cent increase from 1980. For the 1981 period expenditures on lands administered by Energy, Mines and Resources were \$476 million, an increase of \$96 million from the previous year.

**Table 9**

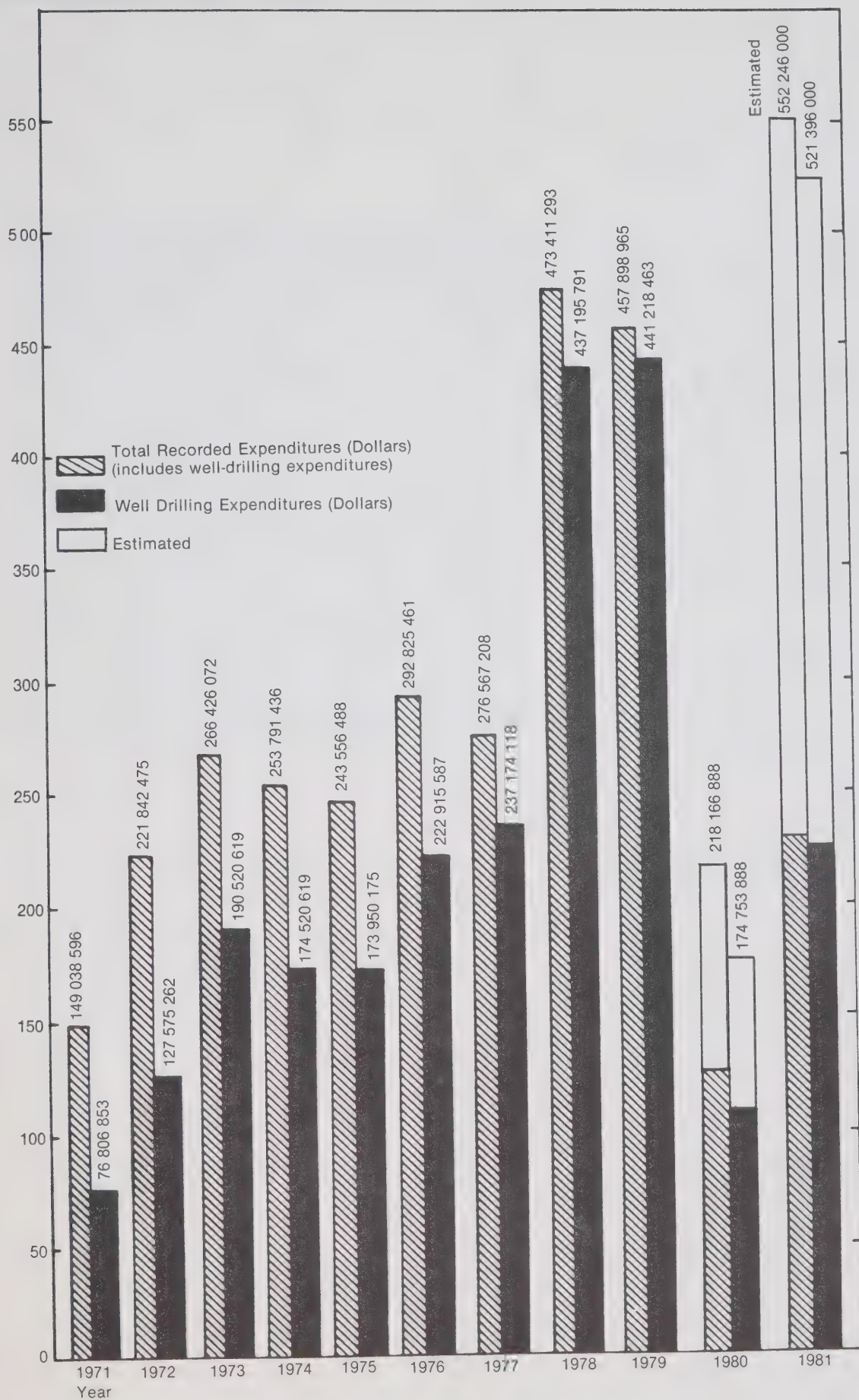
Net Cash Expenditures 1980 (Final)  
(in thousands of dollars)

	East Coast	Offshore Hudson Bay	West Coast	Yukon, N.W.T. and Arctic Islands	Canada
<b>Geological and geophysical expenditures</b>					
(a) Seismic crew expenses	34 228	—	144	26 713	390 990
(b) All other geological and geophysical expenses	23 446	—	—	14 812	323 895
<b>Land and lease acquisition and retention</b>					
(a) Permit fees and acquisition costs	405	—	—	51	1 329 087
(b) Non-producing acreage retention costs	1 845	—	—	6 186	132 821
(c) Producing lease and surface rentals	601	—	—	687	37 009
Exploratory drilling	292 686	—	—	407 272	2 705 974
Development drilling	—	—	—	37 573	1 308 841
<b>Other capital expenditures</b>					
(a) Tangible well and lease equipment	453	—	—	54 584	811 663
(b) Pipelines and related facilities	—	—	—	23	76 135
(c) Secondary recovery and pressure maintenance projects	—	—	—	11 879	177 477
(d) Natural gas processing plants	—	—	—	442	311 559
(e) All other capital expenditures	25 864	—	—	28 787	297 767
Field, well and pipeline operations	—	—	—	17 841	1 207 497
Natural gas plant operations	—	—	—	1 140	405 266
<b>Other operating expenditures</b>					
(a) Taxes (excluding income taxes)	194	—	—	73	179 247
(b) Royalties	—	—	—	5 045	4 380 161
(c) Interest expense	39	—	—	555	451 266
(d) Other	629	—	—	4 865	247 576
<b>Total</b>	<b>380 390</b>	<b>—</b>	<b>144</b>	<b>618 528</b>	<b>14 774 231</b>

**Table 10**  
**Net Cash Expenditures 1981 (Preliminary)**  
(in thousands of dollars)

	East Coast	Offshore Hudson Bay	West Coast	Yukon, N.W.T. and Arctic Islands	Canada
<b>Exploration</b>					
a) Oil & gas rights acquisition & rentals	3 036	—	—	7 491	872 405
b) Geological and geophysical	74 119	—	200	56 766	586 291
c) Exploration drilling	388 263	—	—	682 461	2 871 395
Development drilling	—	—	—	16 347	1 247 997
<b>Production</b>					
a) Natural gas processing plants	—	—	—	88	347 029
b) Machinery and equipment	6 719	—	—	16 782	245 510
c) Office buildings	—	—	—	600	85 594
d) Land	—	—	—	—	15 912
<b>Other production facilities:</b>					
i) Tangible well and lease	3 331	—	—	35 318	639 036
ii) Pipelines and related facilities	—	—	—	—	76 499
iii) All enhanced recovery projects	—	—	—	1 600	155 125
<b>Total royalties</b>	—	—	—	4 470	4 905 679
<b>Natural gas plant operations</b>	—	—	—	1 300	446 120
<b>Field and well &amp; gathering operations</b>	—	—	—	13 678	1 504 671
<b>Taxes, excluding income tax</b>	116	—	—	229	210 388
<b>Other operating costs</b>	—	—	—	10 303	46 901
<b>Total Net Cash Expenditures</b>	<b>475 584</b>	<b>—</b>	<b>200</b>	<b>847 433</b>	<b>14 256 552</b>

**Figure 18**  
**Oil and Gas Exploration Expenditures**  
**Submitted for Work Credits**





# Production, Processing and Refining

## Norman Wells Oil Field

The Norman Wells oil field, located in the west central part of the Northwest Territories, had 55 oil wells capable of production in 1981, with 36 producing regularly. Total gross field production during the year averaged 474.6 m<sup>3</sup>/d of oil (an increase of 61.8 m<sup>3</sup>/d over 1980) plus 127.6 × 10<sup>3</sup>m<sup>3</sup>/d of gas (an increase of 102.1 10<sup>3</sup>m<sup>3</sup>/d) for a yearly total of 173.4 10<sup>3</sup>m<sup>3</sup> of oil and 46.6 10<sup>6</sup>m<sup>3</sup> of gas.

The only refinery in Canada located north of 60° is located at Norman Wells and is operated by Esso Resources Canada Ltd. It has a calendar day capacity of 508 m<sup>3</sup>. In 1981, the refinery processed an average of 477 m<sup>3</sup>/d of locally produced crude oil. The total refinery output of all products during 1981 was 99.8 10<sup>3</sup>m<sup>3</sup>.

## Pointed Mountain Gas Field

In the Northwest Territories 4 gas wells (G-62, K-45, P-53 and A-55) produced gas at a combined gross average rate of 0.96 10<sup>6</sup>m<sup>3</sup>/d plus 40.5 m<sup>3</sup>water/d for a yearly total of 350.9 10<sup>6</sup>m<sup>3</sup> of gas and 11 023.9 m<sup>3</sup> of water.

## Kotaneelee Gas Field

In the Yukon Territory the Kotaneelee Gas Field was shut in for lack of markets for its gas.



Esso Issungnak 2 O-61 artificial island well in the Beaufort Sea.

# Pipeline and Development Projects

## **Arctic Liquefield Natural Gas (LNG) Pilot Project (APP)**

An application was filed with the National Energy Board in January 1979 requesting approval of a combined pipeline and liquefied natural gas (LNG) tanker project to move a daily average volume of  $7.065 \times 10^6 \text{ m}^3$  of gas from Melville Island to an east-coast port. The following information outlines the main aspects of this program.

### **General**

Project partners: Petro-Canada 37.5%; Nova 25.0%; Dome Petroleum Ltd. 20.0%; Melville Shipping Ltd. 17.5%. [Partners in Melville Shipping are Federal Commerce and Navigation Ltd., Upper Lakes Shipping Ltd., Canada Steamship Lines Ltd. (1975)].

Cost of project: \$1.8 B (1980), excluding field development.

Date of application to National Energy Board to export gas: January 17, 1979.

Development time and money spent to date: 5 years and \$33 M.

Construction time: Four years (10 000 man-years for ships; 13 000 man-years for other aspects of the project).

Project life: 20 years.

### **Natural Gas Field Development**

Ownership: Panarctic Oils Ltd. 100 percent.

Field location: Drake Point Field, Melville Island, N.W.T.

Field gas reserves:  $156 \times 10^9 \text{ m}^3$

Gas reserves required for project:  $60 \times 10^9 \text{ m}^3$

Cost of field development: \$164 m (1980).

Number of wells: Eight onshore wells.

Operating staff: 21.

### **Pipeline**

Ownership: Arctic Pilot Project.

Length: From field to Bridport Inlet – 160 km.

Diameter: 560 mm.

Pipeline cost: \$138M (1980).

Operating staff: six.

### **LNG Facilities**

Ownership: Arctic Pilot Project.

Location: Bridport Inlet, southern coast, Melville Island, N.W.T.

Terminal costs: \$817M (1980).

Length of main pier: 600 m.

Terminal storage capacity:  $200\,000 \text{ m}^3$ , barge mounted.

Operating staff: 40.

### **Marine Transportation**

Ownership: Arctic Pilot Project.

Number of ships: Two.

Classification: Arctic Class-7 icebreakers.

Length of ships: 395 m.

Beam of ships: 50 m

LNG capacity for each ship:  $140\,000 \text{ m}^3$

Power level: 112 MW (megawatts) – gas/steam turbine electric (four times that of standard LNG carriers of comparable size)

Propulsion: three fixed pitch propellers per ship

Length of voyage: 33-day round trip in winter

16-day round trip in summer

(A total of 19 round trips/year).

Cost of two LNG carriers: \$625M (1980).

Operating staff: 42 per crew (four crews).

### **Southern Receiving Terminal**

Ownership: Transcanada Pipelines 100%.

Two possible locations: Strait of Canso,  
Nova Scotia  
St. Lawrence River,  
Quebec

Terminal costs: \$199M (1980).

Terminal storage capacity:  $200\,000 \text{ m}^3$  in two tanks

Operating staff: 43

It is proposed that the LNG be regasified at one of the two prospective terminal points and distributed to eastern Canadian customers via a new distribution pipeline owned by TransQuebec and Maritime Pipeline Inc. By displacement, additional gas would be available for export to United States markets from Alberta.

Development of the project, including the supporting marine transport elements, would be considered as a pilot project to test the technical and economic viability of production and transportation of gas from the Arctic Islands.

The NEB will commence public hearings into the project in early 1982.

## Norman Wells Pipeline

Projected higher demands will make it economical to increase production at the Norman Wells oil field from 477 m<sup>3</sup>d to 3 975 m<sup>3</sup>d (3 000 to 25 000 bpd) by installing a waterflood operation. Plans to achieve this rate of production were completed in 1979 and applications for their approval were submitted to regulatory bodies in 1980.

In 1981 Interprovincial Pipeline received permission from the National Energy Board to construct a 300 mm pipeline from Norman Wells to Northern Alberta where connecting pipelines would transport the crude oil to Edmonton. Construction is to commence during the winter of 1983-84 and be completed by July 1, 1985, when the system will go on stream.

There were fewer participation and research projects in 1981 than in the previous year. In the Beaufort Sea, Esso Resources and Dome Petroleum continued their studies of ice and structures stability. In addition, Dome carried out icebreaking studies during the winter months to ascertain the feasibility of carrying out year-round operations in the Beaufort Sea.

In Davis Strait, PetroCanada completed the projects started under the EAMES program. The object of these studies is the gathering of environmental baseline data for future drilling in the Eastern Arctic.

## Geophysical Surveys

Geophysical Services Incorporated (GSI) carried out seismic surveys in the Beaufort Sea and west of Banks Island in 1981. A total of about 3 000 km was shot.

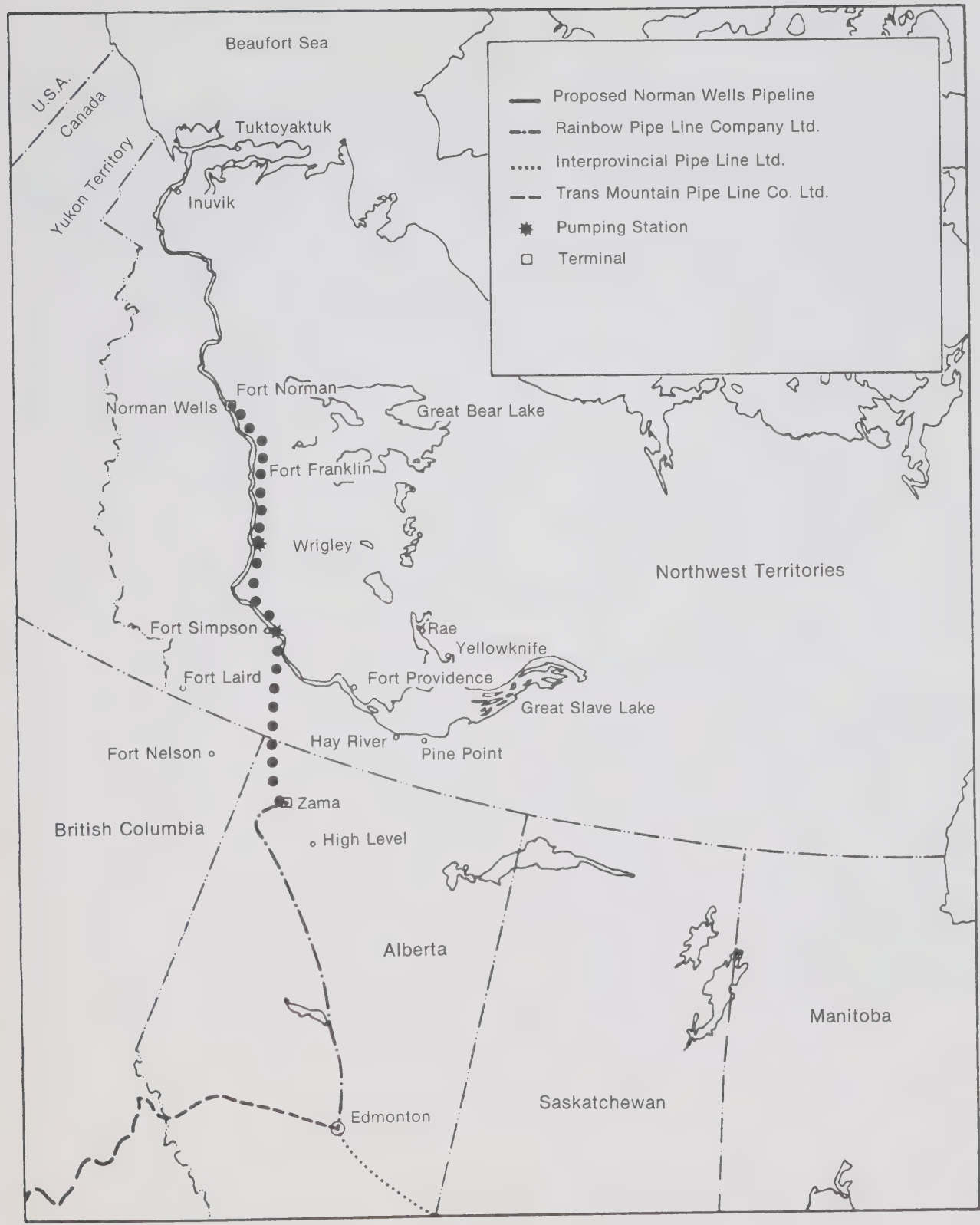
## Research Programs

### APOA and COOSRA

Members of APOA conducted very few programs in 1981. The main thrust of the organization was to organize COOSRA (Canadian Offshore Oil Spill Research Association) with 16 members, all active in the offshore frontier areas of Canada. The objectives of the Association are to increase the collective understanding of oil spills and the manner of coping with them safely, promptly and with minimal environmental damage. Many of the APOA ongoing projects were transferred to COOSRA.

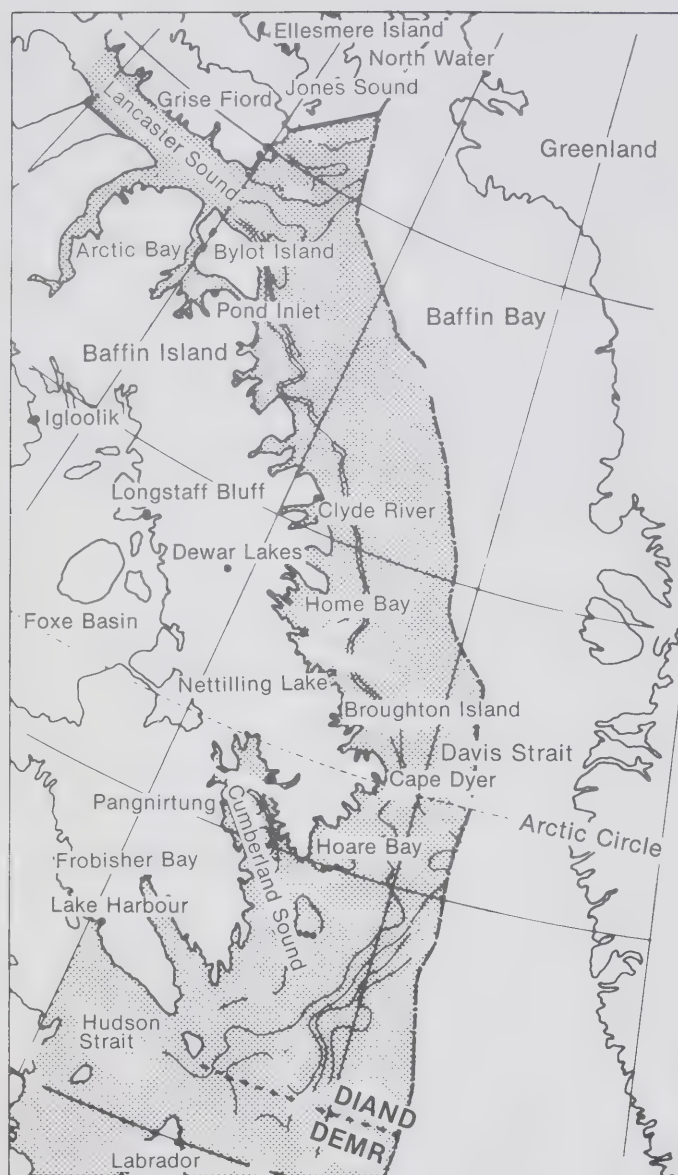
The 1981 COOSRA budget exceeds \$1 million, all of which will be directed to the study of oil spill technology.

Figure 19  
Northern Pipelines





**Figure 20**  
**Eastern Arctic Marine Environmental Study**



### **Lancaster Sound Regional Study**

The Lancaster Sound region of the Arctic Islands archipelago has been under study for some time. The environmental assessment panel which examined the impacts of exploratory drilling in this area recommended that the Department of Indian Affairs and Northern Development (DIAND) undertake a comparative study of the region to identify and assess the best use of resources in the region. A comprehensive study is being conducted by DIAND, in collaboration with four other federal departments and the Government of the Northwest Territories. The study examines the potential relationship between the national interest in the exploration, development and shipment of hydrocarbons and minerals in and through the Sound, the biological resources and the traditional and future use of those resources by the region's Inuit residents.

The Lancaster Sound Regional Study group published its initial findings in 1981 in the form of a draft green paper designed to stimulate public participation in the identification of issues and development of options for the region's future. The results will be presented in a final green paper to be published in mid-1982 and will contain a series of options for the future use and management of the region's resources, based on public opinion expressed during the review. It will also put forward alternatives for the implementation of comprehensive land use planning in the Lancaster Sound region.

### **Land Use Planning**

Cabinet approved a northern land use planning process in July, 1981. The policy calls for the establishment of an interdepartmental Land Use Policy Committee, chaired by the Assistant Deputy Minister, Northern Affairs Program, and Land Use Planning Commissions in each territory to direct the conduct of planning in specific areas.

Since July of last year, DIAND has been consulting with other federal departments, territorial governments, native organizations and other interest groups concerning the organization, structure and process to implement the programs. With respect to land use planning in the Beaufort area, DIAND will prepare an interim plan by the end of March, 1983.

Such planning in those areas where hydrocarbon production and transportation may occur will provide a comprehensive context in which development decisions can be taken. These decisions will be able to account for multiple land use and conservation needs in environmental and culturally sensitive regions. Such planning must also recognize and incorporate as appropriate the results of land claims negotiations which will serve to define the native people's interests more specifically. The regional planning policy being implemented is flexible and will respond to changing circumstances in this regard.

### **Beaufort Region Environmental Impact Statement**

In July 1980, the Minister of Indian Affairs and Northern Development referred all development proposals in the Beaufort Region to the Minister of the Environment for a formal review under the Environmental Assessment and review Process (EARP). Following the referral, the three development project proponents, Dome, Esso and Gulf, initiated work on the Environmental Impact Statement (EIS), with Dome administering the project.

The EIS will consist of seven primary volumes. Each volume will cover specific areas of information needed to address developmental, production, environmental and socio-economic issues.

The proponents expect the seven volumes to be completed by the fall of 1982. Public hearings may commence as early as January 1983.

# Appendix I

## Sources of Information

### Publications

#### Maps

Many maps dealing with the northern resource activities are available from the Northern Non-Renewable Resources Branch, Department of Indian Affairs and Northern Development (DIAND), or from the Resource Evaluation Branch, Canada Oil and Gas Lands Administration.

#### Reports

The following reports may be obtained from Supply and Services Canada, Printing and Publishing, or from the office of the Resource Evaluation Branch, Canada Oil and Gas Lands Administration, in Calgary. Prepayment is required.

Schedule of Wells 1921-1979	\$35.00
1980 Supplement	2.50
Oil and Gas Statistical Report No. 3 (1921-1981)	In Press

*Technical Reports available for Inspection 1920-80*  
— (Geological and geophysical reports released from confidential status are available for public inspection only in the office of the Canada Oil and Gas Lands Administration, Calgary.)

### Other Sources of Information

Information on northern resource activities may be obtained from the Director, Northern Non-Renewable Resources Branch, DIAND, Ottawa, Ontario. Cores and samples from wells drilled on Canada Lands north of 60°N, except the Baffin Bay-Davis Strait region, are stored at the Institute of Sedimentary and Petroleum Geology, 3303-33rd St. N.W., Calgary, Alberta. Cores and samples from wells drilled in the Baffin Bay-Davis Strait region are stored at the Atlantic Geoscience Centre, Box 1006, Dartmouth, Nova Scotia. Such samples and cores for wells as have been released from confidential status pursuant to the Canada Oil and Gas Land Regulations and the Canada Oil and Gas Drilling Regulations may be inspected at these locations. Further, one set of samples is stored under the auspices of the Regional Manager, Canada Oil and Gas Lands Administration, at the DIAND Corehouse in Yellowknife. A list of such wells may be obtained from the Director-General, Resources Evaluation, Canada Oil and Gas Lands Administration. Specialized and technical literature pertaining to northern Canada may be obtained from the following:

#### **Department of Indian Affairs and Northern Development**

- (1) Departmental Library, 10 Wellington St., Hull, Quebec
- (2) Resource Evaluation Branch  
Canada Oil and Gas Lands Administration  
Calgary, Alberta

#### **Department of Energy, Mines and Resources**

1. Geological Survey of Canada — Ottawa, Ontario
  - a. Institute of Sedimentary and Petroleum Geology — Calgary, Alberta.
  - b. Atlantic Geoscience Centre, Bedford Institute of Oceanography — Dartmouth, Nova Scotia.
  - c. Cordilleran Division, Vancouver, British Columbia.
  - d. Pacific Geoscience Centre, Patricia Bay Institute of Ocean Sciences — Sidney, British Columbia.
2. Earth Physics Branch — Ottawa, Ontario.



**Department of National Defence**

Research and Development, Scientific Information Service — Ottawa, Ontario.

**Transport Canada**

(1) Canadian Coast Guard — Ottawa, Ontario.

- Branches — Aids and Waterways
- Fleet Systems
- Ship Safety
- Coast Guard Emergencies
- Telecommunications and Electronics Branch, Edmonton, Alberta and Ottawa, Ontario.

(2) Civil Aviation Branch — Winnipeg, Manitoba.

**Arctic Institute of North America** —  
Calgary, Alberta.

**National Research Council of Canada** —  
Ottawa, Ontario

**Public Libraries**

The following brochures published by the Department of Indian Affairs and Northern Development may be available in some public libraries:

- i. Guide to Northern Non-Renewable Resources
- ii. Communication and Transportation Facilities  
Queen Elizabeth Group — Arctic Islands
- iii. Resources Management Division — Responsibilities and Administration
- iv. Oil and Gas Canada Lands — Volume No. 2
- v. Oil and Gas Canada Lands — Edition No. 3
- vi. Oil and Gas in the Yukon and Northwest Territories — Edition No. 4 — 1967
- vii. Oil and Gas — North of 60 — (annual editions 1968-1980)
- viii. Prospectus — North of 60
- ix. Procedures, Licensing, Legislation & All That

**Information and Procedures Concerning Operations of Canada Lands**

Certain federal agencies are concerned with exploration of Canada Lands and must be notified prior to the commencement of any exploration activity. The operator or permittee, not the contractor, is responsible for providing the requisite advance notice of planned programs to these agencies by writing directly to them.

For offshore programs, the Director, Northwest Territories Region, Northern Affairs Program, DIAND, at Yellowknife, Northwest Territories, as well as the Canada Oil and Gas Lands Administration must be informed with respect to each program. He will communicate with every department and agency on a need-to-know basis with respect to Marine Geophysical Programs. In the case of the Hudson Bay region, operators must also inform the National Research Council of Canada of proposed operations to be undertaken during the summer.

Circumstances may be such that other agencies should be notified as well, and these are listed on the following pages, together with the names of persons who can be of assistance. For example, since operators are responsible for any damage they may cause to underwater commercial cables, it is recommended that they contact the Canadian Hydrographic Service for cable-lay data covering the area over which the work is to be performed. Similarly, the Department of National Revenue, Customs and Excise should be contacted by the importing company if vessels or equipment are to be brought in from abroad.

Information in the brochure *Procedures, Licensing, Legislation & All That* outlines some of the procedures and requirements regarding Northern Natural Resource Development. Copies may be obtained from the Regional Directors in Yellowknife and Whitehorse.



### **Canada Oil and Gas Lands Administration**

The Canada Oil and Gas Lands Administration (COGLA) is responsible for the administration of federal interests in the petroleum resources in the Yukon, Northwest Territories, Arctic Islands and adjacent offshore areas, and off Canada's east and west seacoasts, and in the Hudson Bay and Hudson Strait regions.

Generally, all correspondence should be addressed to:

M. Taschereau,  
Administrator,  
Canada Oil and Gas Lands Administration,  
Tower 'B', 355 River Road,  
VANIER, Ontario K1L 6S4

The Canada Oil and Gas Lands Administration officers may be reached by:

Telephone: (613) 993-3760

Telex: 053-4366

Telecopier: (613) 993-9897

The Land Management Branch, through the issuance of exploration agreements and production leases and licences, makes available rights to petroleum development on all Canada Lands and ensures that holders of such terminable grants fulfill the terms and obligations stipulated in the regulations in order to maintain their interests in good standing.

Advice and assistance on matters relating to the disposition and administration of oil and gas rights may be obtained from:

R.L. Harrison,  
Director-General,  
Land Management Branch.

The Resource Evaluation Branch evaluates geological and geophysical information submitted by operators and assesses the petroleum resource potential of prospects and specific areas of Canada Lands in the Territories and offshore regions, as well as for federally owned mineral rights in the provinces, for resource administration purposes. The Branch is also responsible for the handling and curation of lithologic and paleontologic material from wells and for the assembly and maintenance of a data bank of geological and geophysical information.

Requirements and procedures with regard to the submission, confidentiality and subsequent examination of geophysical and geological data, including well materials, as well as sources of geological information and related matters, may be obtained from:

D.F. Sherwin,  
Director-General,  
Resource Evaluation Branch.

The Engineering and Control Branch exercises regulatory control over all activities associated with exploration, drilling, production and conservation of oil and gas. This control includes the analysis of operational hazards, of proposed equipment and installations and the nature and economic potential of reservoirs. Operators must meet the requirements of the Branch regarding the safety of personnel, the protection of the environment, the prevention of pollution and waste, and the conservation of resources.

Assistance on such operational matters as the drilling, testing, completion or plugging of wells; offshore structures; geophysical surveys; reporting requirements; pollution contingency plans; offshore environmental and feasibility projects; and the availability of reports after their release from confidential status may be obtained from:

L.V. Brandon,  
Director-General,  
Engineering and Control Branch,

In Yellowknife, N.W.T., information and assistance on operational matters in the northern region (Yukon Territory, Northwest Territories, Arctic Islands and adjacent offshore areas) may be obtained from:

Regional Manager,  
Canada Oil and Gas Lands Administration,  
P.O. Box 1500,  
Yellowknife, N.W.T.  
X1A 2R3  
Name: M.D. Thomas  
Phone: (403) 920-8178

On the east coast, information and assistance on operational matters in the Maritimes Region and facilities for the examination of well materials, and exploration and assessment reports for all of the east coast, is available from the Branch's maritime regional office in Dartmouth:

Offshore Manager — Maritimes,  
Canada Oil and Gas Lands Administration,  
Department of Energy, Mines and Resources,  
Bedford Institute of Oceanography,  
P.O. Box 1006,  
Dartmouth, Nova Scotia B2Y 4A2  
Name: T.W. Dexter  
Phone: (902) 426-3179  
After hours: (902) 477-5886

In St. John's, Newfoundland, information and assistance on operational matters in the Newfoundland Region is available at the Branch's Newfoundland regional office.

Regional Manger — Newfoundland Region,  
Canada Oil and Gas Lands Administration,  
P.O. Box 127, Station "C",  
St. John's, Newfoundland A1C 5H5  
Name: A.F. Halcrow  
Phone: (709) 737-2125

The Environmental Protection Division assesses the environmental and sociological consequences of offshore petroleum resource activity on frontier lands south of 60° to ensure that projects are environmentally safe, and socially and economically acceptable to the region's coastal communities.

The Division's responsibilities include: the evaluation of weather, sea and ice conditions in operational areas; the assessment of the effects of offshore operations on the marine and coastal biota; the approval of oil spill contingency plans submitted by industry; and the promotion of environmental research such as the Offshore Labrador Biological Studies (OLABS) Programme.

For further information contact:  
Director-General,  
Environmental Protection Division,  
Canada Oil and Gas Lands Administration,  
Vanier, Ontario  
K1L 6S4

### **Department of Indian Affairs and Northern Development**

A land use permit must be acquired for every land use operation, including drilling operations. A water licence or water authorization is required for all water use in accordance with the Northern Inland Waters Act and Regulations. Advance notice of 90 days is required before the start of drilling operations and all seismic activities, including marine seismic surveys involving the use of high explosives, in the event that qualified observers are needed. Notice of 45 days to the regional director is required before the start of a seismic survey in which a source of acoustical energy, other than high explosives, is to be used.

Information and advice on the Land Use Regulations, land use permits and water use authorization may be obtained:

For the Northwest Territories:

Director,  
Northwest Territories Region,  
Northern Affairs Program,  
Department of Indian Affairs and Northern Development,  
P.O. Box 1500,  
Yellowknife, Northwest Territories X0E 1H0  
Name: P.H. Beaubier  
Phone: 403-920-8111

For the Yukon Territory:

Director,  
Yukon Territory Region,  
Northern Affairs Program,  
Department of Indian Affairs and Northern Development,  
200 Range Road,  
Whitehorse, Yukon Territory, Y1A 3V1  
Name: D. Watson  
Phone: 403-668-5151

## **Department of Energy, Mines and Resources**

### ***Surveys and Mapping Branch***

Information on the systems, methods and equipment used for positioning and surveying of exploration work may be subject to review by this agency. Moreover, legal surveys must be made in accordance with instructions of the Surveyor General.

Enquiries concerning surveying may be directed to:

Surveyor General and Director,  
Legal Surveys Division,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
Ottawa, Ontario K1A 0E9  
Name: W.V. Blackie  
Phone: (613) 995-4341

Information concerning control surveys may be obtained from:

Geodetic Survey Division,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
Ottawa, Ontario K1A 0E9  
Name: F.W. Mosienko  
Phone: (613) 995-4024

When requesting control survey data, the area involved should be defined by latitude and by longitude, and the request should indicate that the data are required for oil and gas exploration related surveys.

Air photographs covering all portions of Canada may be obtained from:

National Air Photo Library,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
615 Booth St.,  
Ottawa, Ontario K1A 0E9  
Phone: (613) 995-4552  
Attention: D. Rombough

and

Publications and Air Photo Section,  
Institute of Sedimentary and Petroleum Geology,  
Department of Energy, Mines and Resources,  
3303 - 33rd Street, N.W.,  
Calgary, Alberta T2L 2A7  
Phone: (403) 284-0110  
Attention: Mrs. D. Cormier

Topographic maps, aeronautical charts and numerous other map publications may be obtained from:

Canada Map Office,  
Surveys and Mapping Branch,  
Department of Energy, Mines and Resources,  
615 Booth St.,  
Ottawa, Ontario K1A 0E9  
Phone: (613) 998-9900  
Attention: P.K. Andrews

or  
Map Sales Office, Legal Surveys,  
Department of Energy, Mines and Resources,  
Bellanca Building,  
Yellowknife, Northwest Territories X1A 2N5

or  
Regional Geologist,  
Department of Indian Affairs and Northern Development,  
200 Range Road,  
Whitehorse, Yukon Territory Y1A 3V1

or  
Geological Survey of Canada,  
Institute of Sedimentary and Petroleum Geology,  
3303 - 33rd St. N.W.  
Calgary, Alberta T2L 2A7

or  
Information Service and Sales,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
100 West Pender St., 6th Floor,  
Vancouver, British Columbia V6B 1R3

or  
Maritimes Resource Management Services,  
Information Centre,  
Department of Energy, Mines and Resources,  
P.O. Box 310,  
16 Station St.,  
Amherst, Nova Scotia B4H 3Z5

or



Ministère de l'Énergie des Mines et des  
Ressources  
Bureau régional de vente de cartes  
1535 Chemin Ste-Foy  
Québec (Québec) G1S 2P1

***Geological Survey of Canada***

The Geological Survey of Canada carries out systematic geological and geophysical surveys in the sedimentary basins of Canada, including parts of the regions offshore from the east and west coasts, in Hudson Bay, and in the Arctic Islands.

Enquiries regarding operations and publications of the Geological Survey should be made to:

For operations:

Chief Program Officer,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
601 Booth Street,  
Ottawa, Ontario K1A 0E8  
Name: A.M. Kelly  
Phone: (613) 995-4182

For publications:

Publications Services,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
601 Booth Street,  
Ottawa, Ontario K1A 0E8  
Name: J.L.L. Touchette  
Phone: (613) 995-4342

or to:

Director,  
Institute of Sedimentary and Petroleum Geology,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
Calgary, Alberta T2L 2A7  
Name: W.W. Nassichuk  
Phone: (403) 284-0110

or to:

Director,  
Atlantic Geoscience Centre,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
P.O. Box 1006,  
Dartmouth, Nova Scotia B2Y 4A2  
Name: M.J. Keen  
Phone: (902) 426-2367

or to:

Director,  
Cordilleran Division,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
100 W. Pender Street,  
8th Floor,  
Vancouver, British Columbia V6B 1R8  
Name: R.B. Campbell  
Phone: (604) 666-1529

or to:

Head, Marine Geology Section,  
Pacific Geoscience Centre,  
Geological Survey of Canada,  
Department of Energy, Mines and Resources,  
Box 6000,  
Sidney, British Columbia V8L 4B2  
Name: C.Y. Yorath  
Phone: (569) 656-8418

***Polar Continental Shelf Project***

The Polar Continental Shelf Project is a continuing investigation of the continental shelf fringing the Arctic coast of Canada, adjacent parts of the Arctic Ocean basin, the islands of the Canadian Arctic Archipelago and the intervening waters, and other areas of special interest.

Enquiries regarding surveys and scientific studies in Arctic areas may be directed to:

Director,  
Polar Continental Shelf Project,  
Department of Energy, Mines and Resources,  
Ottawa, Ontario K1A 0E4  
Name: G. Hobson  
Phone: (613) 996-3388



### ***Earth Physics Branch***

The Earth Physics Branch operates a network of Arctic geophysical observatories and carries out systematic geophysical surveys and studies throughout Canada including the Arctic.

Enquiries regarding the scientific studies, surveys and publications of the Earth Physics Branch should be directed to:

Director-General,  
Earth Physics Branch,  
Department of Energy, Mines and Resources,  
Ottawa, Ontario K1A 0Y3  
Name: K. Whitham  
Phone: (613) 995-5464

### **Department of Fisheries and Oceans**

#### ***Fisheries Management***

Information may be obtained:

on Yukon freshwater and marine fish from:

Director-General,  
Fisheries Management,  
Fisheries and Oceans,  
1909 West Pender Street,  
Vancouver, British Columbia V6E 2P1  
Name: Dr. E. Johnson  
Phone: (604) 666-6097

on Northwest Territories freshwater fish, including Arctic char from:

Director-General,  
Fisheries Management,  
Fisheries and Oceans,  
Freshwater Institute,  
501 University Crescent,  
Winnipeg, Manitoba R3T 2N6  
Name: Dr. G.H. Lawler  
Phone: (204) 269-7379

on Northwest Territories, including Hudson Bay, marine fish and marine mammals from:

Director,  
Arctic Biological Station,  
Fisheries and Oceans,  
Ste. Anne de Bellevue, Quebec  
H9X 3L6  
Name: Dr. A. Mansfield  
Phone: (514) 457-3660

General information on environment assessment studies and research relating to contaminants in freshwater and marine water of the Arctic from:

Director,  
Aquatic Environment Branch,  
Fisheries and Oceans,  
240 Sparks Street,  
Ottawa, Ontario K1A 0E6  
Name: Dr. J.C. MacLeod  
Phone: (613) 995-1818

#### ***Ocean and Aquatic Sciences***

The Canadian Hydrographic Service publishes charts of Canadian navigable waters.

General information concerning charts may be obtained from:

Canadian Hydrographic Service,  
Department of Fisheries and Oceans,  
615 Booth Street,  
Ottawa, Ontario K1A 0E6  
Name: Mr. L.P. Murdoch  
Phone: (613) 995-4437

Information concerning charts showing Canada's territorial sea and fishing zone limits and related data may be obtained from:

Canadian Hydrographic Service,  
Department of Fisheries and Oceans,  
615 Booth Street,  
Ottawa, Ontario K1A 0E6  
Name: Territorial Waters Officer  
Phone: (613) 995-4450

Commercial cable-lay data may be obtained from:

Canadian Hydrographic Service,  
Department of Fisheries and Oceans,  
615 Booth Street,  
Ottawa, Ontario K1A 0E6  
Name: Mr. J. Bruce  
Phone: (613) 995-4651

Information on tides may be obtained from:

Tides, Currents and Water Levels,  
Canadian Hydrographic Service,  
Department of Fisheries and Oceans,  
615 Booth Street,  
Ottawa, Ontario K1A 0E6  
Name: Dr. W.F. Forrester  
Phone: (613) 995-4511

Information on hydrographic surveys and control data in the eastern Arctic may be obtained from:

Regional Hydrographer,  
Canadian Hydrographic Service,  
Atlantic Oceanography Laboratory,  
Department of Fisheries and Oceans,  
Bedford Institute of Oceanography,  
Dartmouth, Nova Scotia B2Y 4A2  
Name: Mr. T.B. Smith (Acting)  
Phone: (902) 426-3497

Information on hydrographic surveys and control data in the western Arctic may be obtained from:

Regional Hydrographer,  
Canadian Hydrographic Service,  
Department of Fisheries and Oceans,  
Institute of Ocean Sciences,  
Sidney, British Columbia V8L 4A8  
Name: Mr. M. Bolton  
Phone: (604) 656-8347

Information related to physical and chemical oceanography may be obtained from:

Western Arctic (Beaufort Sea and Sverdrup Basin):  
Director-General,  
Ocean and Aquatic Sciences,  
Department of Fisheries and Oceans,  
Institute of Ocean Sciences,  
Sidney, British Columbia V8L 4B2  
Name: Dr. R.W. Stewart  
Phone: (604) 656-8215

Eastern Arctic (Baffin Bay and Davis Strait):

Director-General,  
Ocean and Aquatic Sciences,  
Department of Fisheries and Oceans,  
Bedford Institute of Oceanography,  
Dartmouth, Nova Scotia B2Y 4A2  
Name: Dr. C.R. Mann  
Phone: (902) 426-3492

Central Arctic (including Hudson Bay and James Bay):

Director,  
Ocean and Aquatic Sciences,  
Canada Centre for Inland Waters,  
Department of Fisheries and Oceans,  
P.O. Box 5050,  
Burlington, Ontario  
L7R 4A6  
Name: D.W. McCulloch  
Phone: (416) 637-4673

Data on physical-chemical oceanography, tidal predictions, wave climate, etc.:

Director,  
Marine Environmental Data Service,  
Ocean and Aquatic Sciences,  
Department of Fisheries and Oceans,  
240 Sparks Street,  
Ottawa, Ontario K1A 0E6  
Name: Dr. J.R. Wilson  
Phone: (613) 995-2007

General information on oceanographic activities in the Arctic:

Director-General,  
Marine Sciences and Information Directorate,  
Ocean and Aquatic Sciences,  
Department of Fisheries and Oceans,  
240 Sparks Street,  
Ottawa, Ontario K1A 0E6  
Name: Dr. N.J. Campbell  
Phone: (613) 995-2039

## **Department of the Environment**

### ***Environmental Protection Service***

This Department should be advised by the Regional Director of Resources, Department of Indian Affairs and Northern Development, of any environmental matters such as drilling operations and all seismic activities, including marine seismic surveys, involving the use of high explosives in the event that qualified observers are needed. Information regarding the department's requirement can be obtained from:

Environmental Protection Service,  
Department of the Environment,  
15th Floor, Place Vincent Massey,  
Ottawa, Ontario K1A 0H3  
Name: Dr. R.W. Slater  
Phone: (819) 997-1575 or 997-1576

Information concerning spills of oil or hazardous materials including prevention programs; reporting systems; location of emergency equipment; mapping of sensitive areas; contingency planning and training; and information on research into new cleanup equipment and materials; behaviour and fate of spills; and the detection and tracking of spills may be obtained from:

Director,  
Environmental Emergency Branch,  
Environmental Protection Service  
Department of the Environment  
15th Floor, Place Vincent Massey,  
Ottawa, Ontario K1A 1C8  
Name: Dr. J.D. Kingham  
Phone: (819) 997-2037

### ***Environmental Management Service***

Information concerning wildlife such as the locations of migratory bird sanctuaries and National Wildlife Areas, and the Arctic Ecology Map Series that show important and critical wildlife areas of the Canadian Arctic where human activities can have adverse or destructive impact on wildlife population may be obtained from:

Director-General,  
Canadian Wildlife Service,  
Department of the Environment,  
17th Floor, Place Vincent Massey,  
Ottawa, Ontario K1A 0H3  
Name: Mr. A. Loughrey  
Phone: (819) 997-1301

Information concerning research into stream flow; water levels and quality; permafrost hydrology, flood forecasting; river basin planning; sediment surveys; ice studies; and water demand, supply, use, diversion and conservation; oil spills in icy waters; and environmental impact assessment, may be obtained from:

Director-General,  
Inland Waters Directorate,  
Environmental Management Service,  
Department of the Environment,  
6th Floor, Place Vincent Massey,  
Ottawa, Ontario K1A 0H3  
Name: Mr. N.H. James  
Phone: (819) 997-2055

Information concerning northern forests and vegetation; their mapping; growth; relationship to terrain, soils and landscapes; and stability, may be obtained from:

Director-General,  
Canadian Forestry Service,  
Department of the Environment,  
19th Floor, Place Vincent Massey,  
Ottawa, Ontario K1A 0H3  
Name: Dr. R.J. Bouchier  
Phone: (819) 997-1454

or

Director,  
Petawawa National Forestry Institute,  
Canadian Forestry Service,  
Department of the Environment,  
Chalk River, Ontario K0J 1J0  
Name: R.M. Newnham  
Phone: (613) 589-2885

or  
Director,  
Northern Forest Research Centre,  
Canadian Forestry Service,  
Department of the Environment,  
5320 – 122 Street,  
Edmonton, Alberta T6H 3S5  
Name: Dr. G.T. Silver  
Phone: (403) 435-7210

or  
A/Director,  
Pacific Forest Research Centre,  
Canadian Forestry Service,  
Department of the Environment,  
506 West Burnside Road,  
Victoria, British Columbia V8Z 1M5  
Name: Dr. T.G. Honer  
Phone: (604) 388-3811

The map series, *Land Use Information Series* (for northern Canada), provides extensive data on renewable resources and related human activities. Coverage now includes all of the Yukon Territory, the Mackenzie Valley and the Great Slave Lake region. Enquiries for obtaining this map series may be directed to:

Canada Map Office,  
615 Booth Street,  
Department of Energy, Mines and Resources,  
Ottawa, Ontario K1A 0E9  
Phone: (613) 998-9900

Further information on the series may be obtained from:

Lands Directorate,  
Department of the Environment,  
20th Floor, Place Vincent Massey,  
Ottawa, Ontario K1A 0H3  
Name: Ms. J. Moore  
Phone: (819) 997-2240

### ***Atmospheric Environment Service***

Requests for information and assistance on meteorological and sea-ice data, climatology, weather forecasting, meteorological instruments and research may be directed to:  
Assistant Deputy Minister,  
Atmospheric Environment Service,  
Department of the Environment  
4905 Dufferin Street,  
Downsview, Ontario M3H 5T4  
Name: Dr. A.E. Collin  
Phone: (416) 667-4760

Information may also be obtained through the Meteorological Liaison Officer in Ottawa. This position is filled on a rotational basis.

Enquiries in Ottawa may be directed to:  
Liaison Meteorologist,  
Department of the Environment,  
13th Floor, Fontaine Building,  
Ottawa, Ontario K1A 0H3  
Name: F. Lemire  
Phone: (819) 997-1588

### **Federal Environmental Assessment Review Office (FEARO)**

FEARO administers the Federal Environmental Assessment and Review Process (EARP). Under EARP all programs, projects and activities initiated or sponsored by federal departments and agencies, or involving federal lands or funds, must be screened for environmental effects. Activities with potentially significant adverse environmental effects must be referred by the initiating federal agency to FEARO for a formal review by an Environmental Assessment Panel. Further information may be obtained from:  
Executive Chairman,  
Federal Environment Assessment Review Office,  
13th Floor, Fontaine Building,  
Ottawa, Ontario K1A 0H3  
Name: Mr. F.G. Hurtubise  
Phone: (819) 997-3426 or 997-1000



**Department of National Defence  
Operations**

The Regional Director of Resources will inform this department of any exploration program proposed for offshore.

Operations in all areas are of interest, to:  
National Defence Headquarters,  
101 Colonel By Drive,  
Ottawa, Ontario K1A 0K2  
Attention: NDOC vice DMOPR

Operations in Baffin Bay and Arctic waters east of longitude 141°W are handled by the office of:  
Commander, Maritime Command,  
Department of National Defence,  
F.M.O.  
Halifax, Nova Scotia B3K 2X0  
Telex: 019-21789

Operations in Arctic waters west of longitude 141°W are handled by the office of:  
Commander, Maritime Forces Pacific,  
Department of National Defence,  
F.M.O.  
Victoria, British Columbia V0S 1B0  
Telex: 049-7410

Operations on-shore north of 60°N are handled by the office of:  
Commander, Northern Region Headquarters,  
Evans Block,  
P.O. Box 6666,  
Yellowknife, N.W.T.  
X1A 2R3

**Search and Rescue**

The Department of National Defence is responsible for the co-ordination of search and rescue (SAR) operations in Canada.

The Canadian area of responsibility is divided into four SAR areas as listed below:

**Edmonton SAR**

This area includes the three Prairie Provinces, all of the Northwest Territories mainland and Arctic Islands, the western half of Hudson Bay, and Baffin Island north of 70°N latitude.

The contact is:  
Rescue Coordination Centre,  
Canadian Forces Base Edmonton,  
Lancaster Park, Alberta  
T0A 2H0  
Phone: (403) 973-8402, 8403

**Victoria SAR**

This area includes British Columbia, Canadian waters off the west coast, the Yukon Territory and the Beaufort Sea south of 70°N and west of 135°W.

The contact is:  
Rescue Coordination Centre,  
Maritime Forces Pacific Headquarters,  
FMO Victoria, B.C.  
V0S 1B0  
Phone: (604) 388-1543, Vancouver (604) 732-4141  
Telex: 049-7410

**Halifax SAR**

This area includes Quebec east of 70°W, the Maritime Provinces, Labrador, Canadian waters off the east coast, Foxe Basin, Hudson Strait and Baffin Island south of 70°N.

The contact is:  
Rescue Coordination Centre,  
Maritime Command Headquarters,  
FMO Halifax, N.S.  
B3K 2X0  
Phone: (902) 426-4730, 4735  
Telex: 019-21533

**Trenton SAR**

This area includes all Ontario, Quebec west of 70°W, eastern Hudson Bay and James Bay.

The contact is:

Rescue Coordination Centre,  
Canadian Forces Base Trenton,  
MPO 303,  
K0K 1B0  
Phone: (613) 392-2811 Locals 3870, 3875  
Telex: 06-62282

Any of the following may also be contacted in case of emergencies: air traffic control centres, airport control towers, radio stations, marine radio stations, RCMP detachments, provincial and municipal police stations.

The following information is required when reporting an emergency:

- a. Name of caller, phone number, and official connection, e.g., RCMP detachment commander, aircraft owner, etc.;
- b. Assistance required;
- c. Description of aircraft, boat, or whatever craft is involved;
- d. Full details as to the nature of distress or emergency.

## **Department of Transport**

### ***Aids and Waterways Branch***

This branch includes three divisions which might have a particular interest in offshore exploration programs:

The Vessel Traffic Management and Information Systems Division requires at least 60 days notice before the commencement of any offshore exploration program, in order that they may issue the appropriate notices to mariners. These notices receive worldwide distribution on a weekly basis.

The Marine Aids Division is responsible for identifying any aids to navigation that may be necessary for the program.

The Navigable Waters Protection Act Programs Division requires advance notice of 90 days in any case where drilling involves the territorial sea, in order for approval to be granted under the Navigable Waters Protection Act.

All communications on these matters should be directed to:

Director,  
Aids and Waterways Branch,  
Canadian Coast Guard,  
Transport Canada,  
Ottawa, Ontario K1A 0N7  
Name: J.N. Ballinger  
Phone: (613) 992-2736

In addition, there are a number of departmental officers who may be contacted in the field should the need arise. Regional Offices of the Canadian Coast Guard are located in St. John's Newfoundland, Dartmouth, Nova Scotia, Québec, Quebec, Toronto, Ontario, and Vancouver, British Columbia. With respect to aids to navigation in the Arctic, the officers listed below may be contacted:

District Manager,  
Canadian Coast Guard,  
Transport Canada,  
101 Boulevard Champlain,  
Quebec, Quebec G1K 4H9  
Phone: (418) 694-3420

(This office handles aids to navigation in the Hudson Bay and Strait area).

or

District Manager,  
Canadian Coast Guard,  
Transport Canada,  
P.O. Box 5002,  
Hay River, Northwest Territories XE 0R0  
Phone: (403) 874-2406

### ***Fleet Systems Branch***

This Branch has major responsibilities in two areas of concern in offshore operations: support of shipping in ice-congested waters, and marine search and rescue.

If operations are being contemplated in areas where ice may be a problem and where ice-breakers or other support may be desired, there should be consultation with the Director, Fleet Systems.

Further information and assistance may be obtained from:

Director,  
Fleet Systems Branch,  
Canadian Coast Guard,  
Transport Canada,  
Ottawa, Ontario K1A 0N7  
Name: J.Y. Clarke  
Phone: (613) 992-4209

#### ***Search and Rescue (Marine)***

The Canadian Coast Guard (CG) of the Department of Transport, Marine Administration is responsible for providing marine search and rescue vessels and the Canadian Coast Guard Marine Controllers who work with Canadian Forces personnel in co-ordinating the marine input to search and rescue operations at Rescue Co-ordination Centres (RCC'S) in Victoria, Trenton and Halifax. CCG personnel completely man Search and Rescue Sub-Centres located in St. John's and Québec. There are no CCG personnel at RCC Edmonton. The Canadian Coast Guard is also responsible for marine accident prevention through boating safety education and regulations and for managing the Canadian Marine Rescue Auxiliary. The Commissioner of the Canadian Coast Guard is co-chairman of the Interdepartmental Committee on Search and Rescue (ICSAR) which is responsible for co-ordinating the search and rescue efforts of the numerous federal departments involved, of which the departments of National Defence and Transport are the principal ones.

Director, Fleet Systems Branch, as above.

or  
Chief, Search and Rescue,  
Canadian Coast Guard,  
Transport Canada,  
Ottawa, Ontario K1A 0N7  
Contact: P.F. Boisvert  
Telephone: (613) 995-5861

#### ***Ship Safety Branch***

This Branch includes the Hull, Machinery, Nautical, Pollution, Air Cushion Vehicle and the Registry of Shipping Divisions. The responsibilities include inspection and certification of ships under the Canada Shipping Act and the Arctic Waters Pollution Prevention Act. This Branch also deals with ship safety and pollution matters arising from ship operations, and the application of the Arctic Shipping Pollution Prevention Regulations as well as with marine personnel, operational and navigation safety matters. At least 60 days notice is required when drilling operations are planned for areas lying in or near chartered ship routes so that any necessary authority may be issued.

Further information and assistance may be obtained from:

Director,  
Ship Safety Branch,  
Canadian Coast Guard,  
Transport Canada,  
Ottawa, Ontario K1A 0N7  
Contact: J. Hornsby  
Telephone: (613) 992-8892

#### ***Canadian Coast Guard Emergencies***

This office is responsible for the marine contingency planning function of the Department of Transport and also supplies co-ordination and assistance when a federal response is made to combat a spill of oil or toxic materials into the marine environment. The response is made under the Coast Guard's Arctic Marine Emergency Plan or in the case of international boundary waters, the appropriate Joint International Plan.

Further information and assistance may be obtained from:

Coast Guard Emergencies,  
Canadian Coast Guard,  
Transport Canada,  
Ottawa, Ontario K1A 0N7  
Name: Capt. M.S. Greenham  
Phone: (613) 992-9743



### ***Coast Guard Casualty Investigations***

The law requires all marine casualties and accidents to be reported without delay in accordance with the Canada Shipping Act and the Shipping Casualties Reporting Regulations.

The office responsible for marine casualties, accidents, inquiries and wrecks is:

Chief,  
Coast Guard Casualty Investigations,  
Canadian Coast Guard, Transport Canada,  
Ottawa, Ontario K1A 0N7  
Contact: Capt. B.D. Thorne  
Telephone: (613) 992-4930/996-3808

### ***Telecommunications & Electronics Branch***

The major responsibilities of this Branch include the provision of maritime mobile communications and the operation and maintenance of electronic aids to navigation. The publication "Radio Aids to Marine Navigation" provides details of all services provided.

The maritime mobile communications function includes a "Safety Service" of weather, ice and navigation broadcasts and the monitoring of designated frequencies for distress, urgency and safety purposes. It also includes a public correspondence service for the transmission and reception of ship-shore radiotelegrams and, where practicable, for ship-shore marine telephone calls.

Further information and assistance may be obtained from:

Director,  
Telecommunications & Electronics Branch,  
Canadian Coast Guard,  
Transport Canada,  
Ottawa, Ontario K1A 0N7  
Name: B.B. Borodchak  
Phone: (613) 996-3621

### **Department of Communications**

#### ***Telecommunication Regulatory Service***

The responsibilities of this agency include the development of technical standards, the selection and co-ordination of radio frequencies, and the licensing of all classes of radio station except broadcasting stations.

An operator planning to use radio-communications in his off-shore activities should make application for licensing of any radio station in Canada or on board any Canadian vessel involved at least six weeks before the proposed in-service date of the communication facility. Details as to the licensing requirements and the necessary application forms may be obtained from the following addresses:

In Ottawa:  
District Manager,  
Department of Communications,  
473 Albert Street,  
Ottawa, Ontario K1R 5B4  
Phone: (613) 992-9642

Companies in western Canada may contact:  
Deputy Director,  
Department of Communications,  
Telecommunications Regulation,  
325 Granville Street,  
Vancouver, British Columbia V6C 1S5  
Phone: (604) 666-1469

District Manager,  
Department of Communications,  
200-386 Broadway Ave.,  
Winnipeg, Manitoba R3C 3Y9  
Phone: (204) 949-4395

District Manager,  
Department of Communications,  
Government of Canada Bldg.,  
820-220-4th Avenue, S.E.,  
P.O. Box 2905, Station 'M',  
Calgary, Alberta T2P 2M7  
Phone: (403) 231-4203

District Manager,  
Department of Communications,  
10th Flr., Liberty Building,  
10506 Jasper Avenue,  
Edmonton, Alberta T5J 2W9  
Phone: (403) 425-5614



District Manager,  
Department of Communications,  
202 - 11117 - 100 Street,  
Grande Prairie, Alberta T8V 2N2  
Phone: (403) 532-3533

Companies in northern Canada may contact:  
District Manager,  
Department of Communications,  
Polaris Building,  
201 - 4133 - 4th Avenue,  
Whitehorse, Yukon Territory Y1A 1H8  
Phone: (403) 667-5102

District Manager,  
Department of Communications,  
P.O. Box 2700,  
Yellowknife, Northwest Territories X1A 2R1  
Phone: (403) 873-3568

Companies in Central Canada (Ontario/Quebec)  
may contact:  
Deputy Director,  
Department of Communications,  
9th Floor, 55 St. Clair Avenue East,  
Toronto, Ontario M4T 1M2  
Phone: (416) 996-6289

Ministère des Communications  
Bureau Régional  
2085 rue Union  
20e étage  
Montreal, P.Q. H3A 2C3  
Phone: (514) 283-5682

Companies in eastern Canada may contact:  
Deputy Director,  
Department of Communications,  
P.O. Box 5090,  
1222 Main Street,  
Moncton, New Brunswick E1C 8R2  
Phone: (506) 858-2025

## **National Research Council of Canada (NRCC)**

### ***Canada Centre for Space Science***

Operators planning offshore activities in the Hudson Bay region must inform this agency of the National Research Council well in advance since scientific sounding rockets are launched from time to time from the NRCC Churchill Research Range. Information is requested well in advance to permit the co-ordination of activities:  
Head of Operations,  
Canada Centre for Space Science,  
National Research Council of Canada,  
100 Sussex Dr.,  
Ottawa, Ontario K1A 0R6  
Name: B.L. Wetter,  
Phone: (613) 993-5836  
Telex: 053-3715

Rockets are also launched from time to time from rocket launch facilities at Cape Parry, Northwest Territories. At such times, the National Research Council of Canada will co-ordinate its activities with oil exploration companies operating in the selected impact areas.

## **Department of National Revenue**

### ***Customs and Excise***

The Headquarters Operations Directorate administers that portion of the Canada Shipping Act that relates to the coastal trade. In this connection, any company importing ships or specialized plants and equipment for exploration work on Canada's seacoasts and among the Arctic Islands may obtain information, assistance and such other contacts as may be necessary in Customs and Excise from:

Director General,  
International Traffic Programs Division,  
Revenue Canada,  
Customs & Excise,  
Ottawa, Ontario K1A 0L5  
Name: E.D. Warren  
Phone: 613-992-0693

## **Canada Employment and Immigration Commission**

### ***Canada Immigration Division***

Director,  
Policy Liaison,  
Recruitment and Selection Branch,  
Canada Employment & Immigration Commission,  
Ottawa, Ontario  
Name: C.W. Lloyd  
Phone: 613-995-3497

The Winnipeg and Edmonton offices of the Canada Employment and Immigration Commission can answer any queries regarding entry into the Northwest Territories. The Vancouver office can respond to queries for entry into the Yukon Territory.

At Tuktoyaktuk, a local RCMP officer is also a representative for Employment and Immigration and can clear entry into Canada via Tuktoyaktuk.

At Inuvik, the Manager, Canada Employment Centre, can be contacted by telephone if prior arrangements are necessary. There is no representative in Aklavik: in the event that a seismic crew prefers to land at Aklavik, arrangements must be made with the Inuvik representative.

# Appendix II

## Directives

The following directives have been sent to all permittees and lessees.

### ***Expenditures Relating to Processing and Interpretation of Geophysical Data Acquired on Canada Lands***

“An information letter was distributed to all Permittees and Lessees advising operators that as from January 1, 1974, expenditures incurred in computer processing and the interpretation of Geophysical Data acquired in the course of exploration activities involving Canada Lands will not be considered eligible for approval as allowable expenditures unless such processing and interpretation has been carried out in Canada.

After January 1, 1974, an operator submitting a claim pursuant to the Canada Oil and Gas Land Regulations, for allowable expenditures involving geophysical operations undertaken on Canada Lands must identify on his statement of expenditures the name of the company or companies involved together with the location of: (a) the computer facilities utilized in the processing of the geophysical data; and (b) the offices wherein interpretation of the geophysical data was undertaken. Expenditures incurred for computer processing must be separately identified and not included as part of the costs incurred for interpretation.

Further in this regard, the processing of geophysical data undertaken on board non-Canadian seismic ships will be considered to be work undertaken outside Canada and not eligible for approval as allowable expenditures.

[Signed]  
Director,  
Northern Non-Renewable Resources Branch,  
Department of Indian Affairs and Northern  
Development.”

### ***Transfer of Interest — Canada Lands***

“The Canada Oil and Gas Land Regulations stipulate that no transfer of an oil and gas permit or lease shall pass any interest in a permit or lease until the transfer is registered in accordance with the Regulations, which registration must be approved by the Chief. Please be advised that one of the considerations for the approval of the registration of a transfer of any interest in a permit or lease will be that all agreements or an executive summary relating to such transfer of interest have been deposited with the Chief.

All permittees are requested, therefore, to arrange to forward a copy of each current agreement, or an executive summary, to the federal agency concerned at their earliest convenience. In future such agreements should be deposited with the Chief of the appropriate federal agency at the time they are made.

The confidentiality of documents relating to these agreements will of course be maintained until permission to release them is given by the Companies involved.

[Signed]  
Director,  
Northern Non-Renewable Resources Branch.”

### ***Importation and Operation of Foreign Vessels***

“The importation and operation of vessels coastwise or between Canadian and foreign ports are subject to the Customs Act, the Canada Shipping Act, and Coastwise and Foreign Shipping Regulations and the Customs Tariff. These acts and regulations, *Inter Alia*, are administered by the Customs Programs Branch of the Department of National Revenue.

A company wishing to import ships or specialized plant and equipment for exploration work off Canada's seacoasts is requested to make application well in advance of the proposed commencement date of any programme. In order to ensure that the application is processed properly, this department should be advised at least ninety days before the commencement of the programme. This lead time of ninety days is needed to determine the suitability of Canadian-flag vessels declared available to fulfill the purposes respecting which temporary entry is sought.

Each application must state the area of operation and the approximate time span, and contain a description of the salient features of the energy source equipment proposed for the particular operation. Information should also be supplied in respect of all other essential criteria required, including bunker and stores capacity, accommodation, clear deck space, size of instrumentation room, electrical energy additional to vessel's normal operation needs and possible draft restrictions.

Any additional information, assistance and other contacts as may be necessary in Customs and Excise may be obtained from:  
 Director,  
 International Traffic Programs Directorate,  
 Department of National Revenue,  
 Customs and Excise,  
 Ottawa, Ontario  
 K1A 0L5  
 Phone: (613) 992-0693"

"To: All Permittees and Lessees  
 All Oil and Gas Operators  
 Canadian Petroleum Association  
 Independent Petroleum Association of Canada  
 Canadian Association of Oil Well Drilling  
 Contractors

### **Metric Conversion**

The Metric Conversion Plan Sector 4.02, as approved by the Metric Conversion Committee and the Petroleum and Natural Gas Industry, became operational in SI on 79-01-01.

The Departments of INA and EMR wish to advise that drilling authorities and other reporting forms were issued in SI units as of 79-01-01, and that after that date departmental data are compiled only in these units. Please consult the 3rd Edition of the Supplementary Metric Practice Guide for the correct usage of terms and abbreviations. This publication is available from the Canadian Petroleum Association in Calgary.

The following table indicates the appropriate units and sensitivities that the Departments will require for various drilling and production data.

Item	Reporting SI unit	Required Sensitivities
Hole size	mm	10 mm (tens of units)
Pressure	kPa	10 kPa (tens of units)
Casing diameters	mm	1 mm (units)
Density	kg/m <sup>3</sup>	1 kg/m <sup>3</sup> (units)
Lease and Permit areas	ha	1 ha (units)
Volume of water, oil and other liquids (15°C)	m <sup>3</sup>	0.1 m <sup>3</sup> (tenths)
Gas volumes (15°C and 101.325 kPa)	10 <sup>3</sup> m <sup>3</sup>	0.1 10 <sup>3</sup> m <sup>3</sup> (tenths)
Depths & short distances	m	0.1 m (tenths)
Distances	km	0.1 km (tenths)
Oil royalty calculations	m <sup>3</sup>	0.01 m <sup>3</sup> (hundredths)
Amount of cement	t	0.01 t (hundredths)

Any questions regarding these matters may be referred to Mr. S.A. Kanik, Northern Program Metric Co-ordinator at 819-997-9444, and to Mr. F. Lepine, RMB Metric Co-ordinator at 613-995-9351."



### **Reporting Requirements for Operators of 3D Seismic Surveys**

Geophysical reports in triplicate must be submitted for all geophysical programs performed on Canada Lands, submission to be made when data becomes available to the operator, or within one year as proposed in Bill C-48 (Canada Oil and Gas Act). Because of the special nature of 3D surveys, additional information is required.

The Geophysical Report for a 3D survey must contain the information described below. If any of the following information does not exist, will not become available, or is not applicable to the survey in question, this should be specifically stated in the report under the appropriate heading.

1. An operations report, as is required for all geophysical surveys, but with special emphasis on survey techniques. In the case of marine programs the methods used for tracking the cable should be described.
2. A processing report, as is required for all geophysical surveys, but with special emphasis on 3D velocity and migration procedures and statics derivation.
3. An interpretation report discussing the results of the data analysis with illustrations as necessary. All maps made in the course of the interpretation are required.

#### **4. Data**

- shot point maps
- copies of the fully processed grid seismic lines. Not all lines must be submitted but a line spacing of not greater than 500m. is required as well as all lines which tie with wells.
- all cross-lines created
- all crooked lines created
- paper copies of all horizontal slice seismic sections including those with special display options. (i.e., phase and amplitude)
- *one copy* of the horizontal time slice movie film
- RMS velocity information

# Appendix III

## Reporting Forms

The Northern Non-Renewable Resources Branch, Department of Indian Affairs and Northern Development, is a member of the Federal-Provincial Committee on Energy Statistics and the Mines Ministers Subcommittee on Oil and Gas Statistics and together with the four Western Provinces and Statistics Canada has standardized all its oil and gas reporting forms. This standardization has removed duplication among government agencies and more importantly, industry can now complete all oil and gas reporting forms from the Western Provinces and the Yukon and Northwest Territories on electronic data processing equipment without change to programs.

<i>Form No.</i>	<i>Title of Form</i>
IAN 52-90-1**	Application for a Drilling Authority
IAN 52-90-2	Well Completion Data
IAN 52-90-3**	Application to Amend a Drilling Authority
IAN 52-90-4**	Application to Change a Well Name
IAN 52-90-5**	Application to Abandon a Well or Suspend Drilling
IAN 52-90-6**	Application to Alter Condition of a Well
IAN 52-90-7	Work-over Report No.
IAN 52-90-8	Application to Commingle Production before Measurement
IAN 52-90-9	Data for Back Pressure Test on Natural Gas Wells-Monograph 7 Method
IAN 52-90-10	Data for Back Pressure Test on Natural Gas Wells-Vitter's Method
IAN 52-90-11	M.P.R. — Oil Calculations
IAN 52-90-12	New Oil Well Report
IAN 52-90-13	New Gas Well Report
IAN 52-90-17	New Service Well Report
IAN 52-90-18	Monthly Water Flood Operations Report

IAN 52-90-20	Monthly Water Receipts and Disposal of Fluids Report
IAN 52-90-23	Geologic Surface Survey & Air-photo Analysis — Expenditures
IAN 52-90-24	Land Geophysical Operations — Expenditures
IAN 52-90-25	Marine Geophysical Programs — Expenditures
IAN 52-90-26	Drilling & Structure Test Drilling Expenditures
IAN 52-90-27	Participation Programs — Expenditures
IAN 52-90-28	Geophysical — Seismic, Aeromagnetometer, Gravity Survey — Participation Program Operators
IAN 52-90-29	Research Program, Environmental Studies — Participation Program Operators
IAN 52-90-30	Geological Surveys, Photo-geological, Mapping and Analyses — Participation Program Operators
IAN 52-91**	Notice of Commencement of Exploratory Work
IAN 52-91-1**	Notice of Commencement of Research and Development Work
IAN 52-92	Application for Authority to Drill Structure Test Hole
IAN 52-93	Report on Abandonment of Structure Test Hole
IAN 52-83	Grouping Notice
IAN 52-103**	Application for Oil and Gas Lease
IAN 51-183	Monthly Accident Summary

All forms to be completed by operator

\*\*To be completed in triplicate; all other forms to be completed in duplicate.

All forms, except IAND 52-83, IAND 52-90-23 to IAND 52-90-27, IAND 52-91, IAND 52-91-1, and 51-103, are submitted to the Regional Oil and Gas Conservation Engineer, Yellowknife, Northwest Territories.

Forms IAND 52-83, 52-90-23 to 52-90-27 and 52-103 are submitted to the Northern Non-Renewable Resources Branch, Ottawa, Ontario K1A 0H4.

Forms IAND 52-91 and 52-91-1 should be submitted to the Oil and Gas Exploratory Operations Section — P.O. Box 2638, Postal Station 'M', Calgary, Alberta T2P 3C1.

The following forms have been issued pursuant to the Canada Oil and Gas Land Regulations and Canada Oil and Gas Drilling Regulations. These forms are to be completed when applicable during the production stage of oil and gas wells, and refinery operations.

<i>Form No.</i>	<i>Title of Form</i>
IAND 52-116-1	Monthly Production Report
IAND 52-116-2	Monthly Disposition and Crown Royalty Statement
IAND 52-116-3	Monthly Gas Gathering Statement
DBS 6511-38	Monthly Oil Pipeline Gathering Operations Statement
IAND 52-116-5	Monthly Crude Oil and Condensate Purchaser's Statement
IAND 52-116-6	Monthly Gas Plant Statement
DBS 6511-37	Monthly Natural Gas Distributors Statement
IAND 52-116-8	Monthly Gas Processing Plant Products Statement
IAND 52-116-9	Monthly Liquified Petroleum Gas Purchaser's Statement
IAND 52-116-10	Monthly Refinery Operations Report
IAND 52-116-11	Monthly Gas Injection Operations Report
IAND 52-116-12	Statement of Nomination and Estimated Requirement of Crude Oil, Condensate and Pentanes Plus
IAND 52-116-13	Monthly Sulphur Plant Operations Report

#### Notes:

All forms to be completed by operator.  
Forms 6511-37 and 6511-38 are completed by the operator in triplicate. The first two copies are to be forwarded to the Northern Non-Renewable Resources Branch in Ottawa, and the third to the Regional Oil and Gas Conservation Engineer, Yellowknife, Northwest Territories.

The other forms listed above are completed in duplicate. The original is submitted to the Northern Non-Renewable Resources Branch in Ottawa and one copy to the appropriate Regional Oil and Gas Conservation Engineer, Yellowknife, Northwest Territories.

All the above forms have been converted to SI units and distributed to industry. The use of SI units became mandatory as of January 1, 1979.

# Appendix IV

## Summaries of the Geological Provinces

### 1 Arctic Stable Platform

The Arctic Stable Platform lies between the Precambrian Shield to the south and the Franklinian geosyncline to the north and west. The area is underlain by thin, gently dipping, relatively undisturbed Lower Paleozoic carbonates that overlie the craton and thicken northward from the Shield. The Platform is divided into several individual basins, Foxe Basin being the one farthest to the east.

### 2 Franklinian Geosyncline (Arctic Fold Belt)

The limits of Paleozoic deformation define the division between the Franklinian Geosyncline and the Arctic Stable Platform to the south and east. The area was the site of continuous sedimentation from Cambrian to Upper Devonian time. Two depositional belts are recognized: a miogeosynclinal belt extending from Banks Island to northern Greenland, and a eugeosynclinal belt exposed only on Axel Heiberg and Ellesmere Islands. Thick carbonates and clastics constitute potential reservoirs. Strata were folded in the Ellesmerian orogeny of Late Devonian or Early Carboniferous time and these folded strata also constitute the "basement" underlying the Sverdrup Basin.

### 3 Sverdrup Basin

A major angular unconformity marks the base of the Sverdrup Basin, a successor basin with a stratigraphic sequence of Lower Pennsylvanian to Tertiary strata overlying the folded Paleozoic rocks of the Franklinian Geosyncline. The structural and depositional axis of the Sverdrup Basin strikes northeast from Banks Island to northern Ellesmere Island. The thickness of sediments in the basin is in excess of 7 600 m along this axis. The sediments, which are interrupted by a number of unconformities, thin from the axis to form an elongate basin. Sediment thickness and facies indicate that the present south and east limits of the basin are close to the original depositional limits. Tertiary strata of the Arctic Coastal Plain overlap the northern and western margins. Evaporites of late Paleozoic age form piercement structures in the axial zone. Upper Cretaceous and older sediments are intruded by igneous sills and dykes of varying thickness, mostly in the eastern half of the basin. The Eureka orogeny, in late Cretaceous and early Tertiary time, produced folding and faulting throughout the basin; deformation was accompanied by emplacement or reactivation of piercement bodies. Intensity of deformation increases towards the northeast margin of the basin. Thick, sandy sequences of Jurassic and Triassic age contain the major hydrocarbon reserves.

### 4 Arctic Coastal Plain

The north and west margins of the Sverdrup Basin, both on land and offshore, are covered by thick relatively undisturbed Tertiary and Pleistocene clastics. Beds dip gently toward, and thicken on, the continental shelf and slope. In this area the continental shelf is approximately 160 km wide. The waters covering the shelf offshore from the Mackenzie Delta are called the Beaufort Sea. The continental slope, here, is between 600 and 3 000 m water depth. The deep Arctic Ocean, termed the Canada Basin, forms an abyssal plain seaward of the slope. The Tertiary and Mesozoic are considered to have the best potential, offshore, for oil and gas. Permanent ice cover and a short drilling season have hindered or made costly the drilling in the offshore regions.



### **5 Baffin Bay-Davis Strait Basin**

The Baffin Bay-Davis Strait Basin lies entirely offshore. Several theories to explain the origin of the basin have been advanced: a widely accepted one involves continental drift by which Greenland and the Baffin land mass spread apart about a pivotal point located somewhere to the northwest. Geophysical surveys have demonstrated that the basin is underlain by an oceanic crust, that there is no midbasin ridge, and that as much as 7 600 m of sediment cover the floor. Sediments thin to zero in nearshore areas and over the Davis Strait Sill. Rocks cropping out around the basin margins are predominantly Precambrian. Major centres of deposition are the Thule Basin off Greenland, the Lancaster Delta, the Home Bay Delta and the Cumberland Delta. Lancaster Sound and Jones Sound are structurally controlled grabens in which thick deltaic clastics accumulated. A major Tertiary drainage system transported sediment to the basin from a source area to the west. The large volume of geologically young sediments and the presence of favourable trapping conditions for hydrocarbons give the Baffin Bay-Davis Strait area a high hydrocarbon potential.

### **6 Banks Basin**

The Banks Basin occupies the central and west-central part of Banks Island and the adjacent coastal plains. Tertiary and Cretaceous clastics overlie mainly Lower and Middle Devonian sediments over much of the area. Proterozoic rocks of the Minto Arch occur at the southernmost tip. The sediments of the Banks Basin have been sparsely drilled and the presence of thick Tertiary and Mesozoic sediments and the reefal facies of the Devonian-Silurian carbonates give the area a moderate potential for hydrocarbon accumulations.

### **7 Mackenzie-Beaufort Basin**

The Mackenzie Delta-Beaufort Sea petroleum province is made up of a thick section containing productive Cretaceous and Tertiary sands. The Mackenzie Delta, the southern portion of the Mackenzie-Beaufort Basin, is bounded by the Romanzof uplift to the southwest, the Richardson Mountains to the south, the Eskimo Lakes Arch to the southeast and the Arctic Ocean to the north. The Beaufort Sea is one of several marginal embayments that occur as indentations in the coastline of the Arctic Ocean. The coastal plain, which lies adjacent to the Beaufort Sea, is laterally continuous with the continental shelf and is considered as the onshore, exposed extension of the Beaufort Sea shelf. The Beaufort Sea petroleum province is contiguous with the Yukon and Mackenzie coastal plains and the Banks coastal plain.

Growth faults extend seaward from the Mackenzie Delta across the coastal plain. Shale diapirs form large, mostly offshore structures. Potential reservoir rocks, which include deltaic and marine sandstones are interbedded and continuous with organic-rich shales.

### **8 Interior Plains**

a) Great Slave Plain — The Great Slave Plain encompasses an area extending westward from Great Slave Lake to the Liard Plateau and Mackenzie Mountains. Underlying strata are mainly of Devonian age, covered in part by remnants of a thick Cretaceous sequence. The total thickness of sediment ranges from zero in the east to more than 3 000 m in the west. Gas reservoirs are found in porous dolomites and limestones of Middle Devonian age.

b) Great Bear Plain — The Great Bear Plain consists of Lower and Upper Cretaceous sediments partially on a bedrock of Ordovician to Devonian age. The total thickness of the sediments wedges from zero in the east to more than 1 800 m in the west along the eastern edge of the Franklin Mountains.

c) Anderson Plain — The Anderson Plain lies east of the Mackenzie Delta. Cretaceous beds cover much of the Plain and lie unconformably on Lower and Middle Paleozoic beds. Sediments more than 2 400 m thick occur in a southwest-northeast trend through the wells C.P.O.G. Kugaluk N-02 and Elf Horton River G-02. Hydrocarbon shows have been encountered in the Cretaceous deposits.

d) Mackenzie Plain — The Mackenzie Plain lies between the Franklin and Mackenzie Mountains. Cretaceous beds lie unconformably on Lower and Middle Paleozoic beds. Sediments range in thickness from 1 200 m to 2 700 m. Oil is produced in the Mackenzie Plain at Norman Wells, from the Devonian Kee Scarp formation. Additional hydrocarbon shows have been encountered in the Cretaceous and Silurian.

e) Peel Plain — The Peel Plain lies northeast of the Peel Plateau and northwest of the Mackenzie Plain. It is covered by Cretaceous and Jurassic sediments which overlie Paleozoic carbonates and shales. The sediments are similar to those of the Mackenzie Plain and range in thickness from more than 4 200 m in the southwest to 2 400 m in the northeast. Hydrocarbon shows have been encountered in the Lower Devonian.

### **9 Liard Plateau and Range**

The Liard Plateau and Range lie west of the southern portion of the Great Slave Plain and northwest of the Fort Nelson Lowland. A thin Cretaceous cover lies unconformably on Paleozoic beds. The Beaver River and Pointed Mountain fields produce or have produced gas from thrustured dolomites of the Nahanni formation of Middle Devonian Age. Production in the now depleted Beaver River field in the Yukon was also from large faulted anticlines containing Mississippian sands.

### **10 Eagle Plain**

The Eagle Plain basin is contained between the Ogilvie and Richardson Mountains. Sediments approach 6 100 m in thickness, of which about 3 000 m are late Paleozoic to Mesozoic in age, the remainder being Cenozoic. The basin has been tectonically deformed. Hydrocarbon shows have been encountered in Mississippian, Devonian and Ordovician beds.

### **11 Peel Plateau**

The Peel Plateau is bounded on the northeast and the east by the Peel Plateau Plain, on the south by the Mackenzie Mountains, and on the west by the Richardson Mountains. The Plateau is covered by Tertiary and Cretaceous clastics unconformably overlying Paleozoic shales and carbonates. The sediments range in thickness from 3 000 m in the east to 6 100 m in the west. Shows of hydrocarbons have been encountered in Cretaceous and Middle Devonian strata.

### **12 Old Crow Basin**

The Old Crow Basin is a relatively unexplored intermontane basin covering an area of about 6 200 km<sup>2</sup> centered at about latitude 68°N and longitude 140°W. Geophysical data indicate a thickness of from 500 to 1 500 m of Mesozoic and Tertiary clastics overlying as much as 3 000 m of Upper Devonian to Permo-Carboniferous sediments. The Old Crow Basin as it now exists was formed by the Laramide orogeny in Tertiary time.

### **13 Whitehorse Basin**

The Whitehorse Basin lies at the northern end of the Central Cordilleran Geosyncline. It is about 240 km long and 110 km wide and contains up to 4 600 m of sediments ranging in age from early Cretaceous to Late Triassic.

A selected bibliography of the geology of the Yukon and Northwest Territories is provided in Appendix V.

# Appendix V

## Selected Bibliography

A wide variety of reports and papers applicable to geological provinces or basins in northern Canada are available; a majority are Geological Survey of Canada (GSC) publications or are in proceedings and memoirs of various societies. A listing of all GSC reports may be found in the *Index to Publications 1959 - 1974* by P.J. Griffen, published by the GSC in 1976. The following is a list of the more important of these papers.

Aitken, J.D., and Glass D.J. (Editors)  
1973: GAC — CSPG Proceedings of the Symposium on the Geology of the Canadian Arctic. Geol. Assoc. Can. and Can. Soc. Pet. Geol.

McCrossan, R.G. (Editor)  
1973: Future Petroleum Provinces of Canada; Can. Soc. Pet. Geol. Memoir 1.

Wren, A.E. and Cruz R.B. (Editors)  
1974: Proceedings of the 1973 National Convention. Canadian Society of Exploration Geophysicists.

Yorath, C.J., Parker, E.R. and Glass, D.J. (Editors)  
1975: Canada's Continental Margins and Offshore Petroleum Exploration. Can. Soc. Pet. Memoir 4.

For a complete list of oil industry technical reports released from confidential status, the reader should refer to the DINA publication *Technical Reports Available for Inspection — 1921-1978*.

Important references not found in the preceding publications are listed below.

### **Northwest Territories — Mainland**

Bily, C. and Dick, J.W.C.  
1974: Naturally Occurring Gas Hydrates in the Mackenzie Delta, N.W.T. Bull. Can. Pet. Geol. Vol. 22, No. 3, pp. 340-353.

Cote, R.P., Rector, R., Lerand, M.  
1974: Gulf Describes Geology of the Parsons Lake Gas find, Bull. Can. Pet. Geol. Vol. 22 No. 1, pp. 72-78.

Crickmay, C.H.  
1970: Ramparts, Beavertail and Other Devonian Formations. Bull. Can. Pet. Geol. Vol. 18, No. 1, pp. 67-79.

Law, J.  
1971: Regional Devonian Geology and Oil and Gas Possibilities, Upper MacKenzie River Area. Bull. Can. Pet. Geol. Vol. 19, No. 2, pp. 437-484.

Meijer-Drees, N.C.  
1975: Geology of the Lower Paleozoic Formations in the Subsurface of the Fort Simpson Area, District of Mackenzie, GSC Pap. 74-40.

Norford B.S. and Macqueen R.W. 1975  
Lower Paleozoic Franklein Mountain and Mount Kindle Formations, District of MacKenzie — This Type Section and Regional Development G.S.C. paper 74-34, 37 pp.

Smith, M.W.  
1976: Permafrost in the Mackenzie Delta. GSC Pap. 75-28.

Vopni, L.K., and Lerbekmo J.F.  
1972: The Horn Plateau Formation: A Middle Devonian Coral Reef Northwest Territories. Bull. Can. Pet. Geol. Vol. 20, No. 3, pp. 498-548.

Young, F.G.  
1976: Upper Cretaceous Stratigraphy, Yukon Coastal Plain and Northwestern Mackenzie Delta. GSC Bull. 249.

Young, F.G., Myhr, D.W., and Yorath, C.J.  
1975: Geology of the Beaufort — Mackenzie Basin. GSC Pap. 76-11.



### ***Eagle Plain and Northern Yukon***

Bamber, E.W. and Waterhouse, J.B.  
1971: Carboniferous and Permian Stratigraphy and Paleontology, Northern Yukon Territory. Bull. Can. Pet. Geol. Vol. 19, No. 1, pp. 29-249.

Lenz, A.C.  
1972: Ordovician to Devonian History of Northern Yukon and Adjacent District of MacKenzie. Bull. Can. Pet. Geol. Vol. 20, No. 2, pp. 321-361.

Miall, A.D.  
1973: Regional Geology of Northern Yukon. Bull. Can. Pet. Geol. Vol. 21, No. 1, pp. 81-116.

Norris, A.W.  
1967: Devonian and Northern Yukon Territory and Adjacent District of Mackenzie Int. Symp. Devonian System. Alberta Soc. Pet. Geol.

### ***Arctic Islands***

Balkwill, H.R.  
1978: Evolution of Sverdrup Basin, Arctic Canada. Bull. Am. Assoc. Pet. Geol. Vol. 62, No. 6, pp. 1004-1028.

Embry, A.F., and Klovan, J.E.  
1976: The Middle — Upper Devonian Clastic Wedge of the Franklinian Geosyncline. Bull. Can. Pet. Geol. Vol. 24, No. 4, pp. 485-639.

Frebold, H.  
1975: Jurassic Faunas of the Canadian Arctic. GSC Bull. 243.

Klovan, J.E. and Embry, A.F. III  
1971: Upper Devonian Stratigraphy, Northeastern Banks Island. Bull. Can. Pet. Geol. Vol. 19, No. 4, pp. 705-729.

Plauchut, B.P.  
1971: Geology of the Sverdrup Basin. Bull. Can. Pet. Geol. Vol. 19, No. 3, pp. 659-679.

Plauchut, B.P. and Jutard, G.G.  
1976: Cretaceous and Tertiary Stratigraphy, Banks and Eglinton Islands and Anderson Plains. Bull. Can. Pet. Geol. Vol. 24, No. 3, pp. 321-371.

Snowdon, L.R. and Roy, K.J.  
1975: Regional Organic Metamorphism in the Mesozoic Strata of the Sverdrup Basin. Bull. Can. Pet. Geol. Vol. 23, No. 1, pp. 131-172.

Stuart-Smith, J.H. and Wennekers, J.H.N.  
1977: Geology and Hydrocarbon Discoveries of Canadian Arctic Islands. Am. Assoc. Pet. Geol. Bull. Vol. 61, No. 1, pp. 1-28.

### ***Arctic Coastal Plain and Continental Shelf***

Sobczak, L.W.  
1975: Gravity and Deep Structure of the Continental Margin of Banks Island and Mackenzie Delta. Can. J. Earth Sci. Vol. 12, pp. 248-395.

### ***Hudson Bay Basin and Lowlands***

Stanford B.V. and Norris, A.W.  
1975: Devonian Stratigraphy of the Hudson Platform: Part I, Stratigraphy and Economic Geology. GSC Memoir 379.

### ***Foxe Basin and Baffin Bay***

Keen, C.E. et al.  
1972: Geophysical Studies in Baffin Bay and Some Tectonic Implications. Can. J. Earth Sci. Vol. 9, No. 3.

Keen, C.E. and Barrett D.L.  
1973: Structural Characteristics of Some Sedimentary Basins in Northern Baffin Bay. Can. J. Earth Sci. Vol. 10, No. 7, pp. 1267-1278.

Trettin, H.P.  
1975: Investigations of Lower Paleozoic Geology, Foxe Basin, Northeastern Melville Peninsula and Parts of Northwestern and Central Baffin Island. GSC Bull. 251.



















JUL 2 1987



